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THE SETTLEMENT SYSTEM IN A LATE PRECLASSIC MAYA COMMUNITY: CERROS, NORTHERN BELIZE

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THE SETTLEMENT SYSTEM IN A LATE PRECLASSIC MAYA COMMUNITY: CERROS, NORTHERN BELIZE

A Dissertation Presented to the Graduate Faculty of

The College

of

Southern Methodist University

in

Partial Fulfillment of the Requirements

for the degree of

Doctor of Philosophy

with a

Major in Anthropology

by

Vernon Lee Scarborough

(B.S., University of Oregon, 1973)

November 19, 1980

THE SETTLEMENT SYSTEM IN A LATE PRECLASSIC MAYA COMMUNITY: CERROS, NORTHERN BELIZE

Approved by:

E. Wyllys Andrews V

Scarborough, Vernon Lee — B.S., University of Oregon, 1973

<u>The Settlement System in a Late Preclassic Maya Community: Cerros, Northern Belize</u>

Advisor: Assistant Professor David A. Freidel

Doctor of Philosophy degree conferred December 16, 1980

Dissertation Completed November 19, 1980

This study is an examination of environmental and social adjustments made by a Late Preclassic community over a 350 year time span. The focus of the study is on the "dispersed-compact" settlement pattern manifest by the community during the major construction at the site during the Tulix phase (50 B.C.-A.D. 150).

The lower featureless landscape around the site was well drained during the initial periods, but it was subject to complicated drainage controls during the massive quarrying projects responsible for the bulk of the Tulix phase monuments. The underlying weathered limestone caprock was systematically removed to maintain adequate drainage of the community during the quarrying of monumental fill. The site plan strongly suggests a well coordinated labor investment in which the entire population was managed by a controlling elite. Any major building project within the 37 hectares of the core area,

as defined by a curvilinear 1200 meter long canal segment, would have been regulated by community wide controls. The entire area inside the canal perimeter was modified to produce a man-made watershed.

Cerros developed from a community dependence on local resources to a central place in northern Belize economic and political interaction. Cerros documents a transition from a small residential aggregate to a major civic center and residential locus. This transition is empirically demonstrated in terms of population density (house mounds/area), energy expenditure (volume of monument fill) and technological advancement (hydrology).

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ACKNOWLEDGMENTS

Many people have helped to shape the form and direction of this dissertation. My committee members have directly assisted in the course of this work and generally reflect my academic background. David Freidel offered me the opportunity to do dissertation research at Cerros. He has influenced my theoretical orientation more than any other person, while encouraging my diverse interests and independent thinking. Garth Sampson has provided his methodological rigor during my entire tenure at Southern Methodist University. His instruction from the outset has cultivated my ecological perspective. Anthony Marks has also provided methodological rigor and instilled a firm respect for critical argumentation. Wyllys Andrews V has encouraged my research and has furnished me with advanced information regarding the Preclassic community of Komchen.

The Belizean government and the Belizean people have permitted this study. The Archaeological Commissioner has encouraged our work and the merchants and laborers of Corozal have repeatedly helped with logistics. However, special mention must be made of the kind and diligent people from Chunox and Copperbank

villages. They have provided the major work force for the Cerros Project and have become close friends of many of the staff. The six seasons the Cerros Project has been in the field have not only produced a force of trained archaeological technicians in these villages, they have promoted a better understanding of Maya heritage and perhaps village identity. I am grateful for the opportunity to have worked in Belize.

The senior staff members of the Cerros Project have been very supportive. Our work at Cerros must be considered a team effort with each person contributing valuable input to the overall success of the project. I have benefitted from and enjoyed our countless discussions. Sorayya Carr, Maynard Cliff, Jim Garber, Susan Lewenstein, Beverly Mitchum and Robin Robertson-Freidel have actively participated in my research. Robin has spent long hours preparing ceramic identification and correlation charts allowing the chronological placement of the many excavated lots in the settlement. Beverly provided supervisory control over many of the test unit exposures and, with Sorayya, oversaw the horizontal excavation exposures on the two ballcourts. Susan carried out survey and excavation in the settlement. Her experience with the Rio Hondo Project proved very helpful in the identification of raised field agricultural plots.

The Cerros Project has been fortunate to have recruited a number of qualified volunteers. In the settlement program, Karim Sadr, Tom Babcock, Marge Morin, Truett Roberts, Karin Smith and Fred Valdez, Jr. have been instrumental in the success of the settlement program. James Webb was responsible for the survey data collected during the 1974 and 1975 field seasons.

Drafting of plans and profiles was done by Karim Sadr, Eleanor Powers, Laurie Evans and Chris Vallender. Robin Robertson-Freidel produced the final draft of the site map. Karim Sadr provided the final draft of the environmental site map. Typing of the final manuscript was done by Kathleen Mooney.

My immediate family has been strongly supportive of the goals I have set for myself. My parents have provided support throughout. My wife, Diana, has provided encouragement, as well as practical aid, throughout this study. She has freely given of her editorial skills and typed the initial draft of the manuscript. Without her aid the study would be something less than what it is.

In addition to the major National Science Foundation funding to David Freidel and Southern Methodist University, I was privileged to receive a NSF dissertation improvement grant during the 1979 field season. This grant coupled with a seed grant from the

Institute for the Study of Earth and Man at Southern Methodist University permitted the completion of the site maps for Cerros.

CHAPTER I

INTRODUCTION

The Late Preclassic Lowland Maya center of Cerros is situated on the northern leeward shore of Lowry's Bight, northern Belize (latitude 18°12'08" N., longitude 88°21'10" W.) (see Fig. 1). Our research has permitted an examination of the Late Preclassic Maya settlement surrounding the investigated Late Preclassic Maya central precinct. The near absence of later construction at Cerros has allowed the examination of Late Preclassic settlement patterns undisturbed by later site modifications or mixing of deposits.

Previous Research

The Late Preclassic period in the Maya Lowlands (300 B.C. - A.D. 150) has been recognized as a time of coalescence which culminated in the technological and sociological achievements of the Classic Maya (Adams 1977; Freidel 1978, 1979). As a result of extensive investigations, it has become clear that the majority of large Classic centers had their origins in the Late Preclassic period (Coe 1965, 1965b; Adams 1977). A key question for the rise of Maya civilization has been the

process by which the settlement system (Winter 1969), as a reflection of social organization, developed from Late Preclassic antecedents towards the stratified "state" level of complexity manifested in Late Preclassic times (c. A.D. 600-900). (See Webster 1976:1-7 and Service 1975 for discussions of chiefdom vs. state polemic.)

Population density in the lowlands was not great during the Early and Middle Preclassic periods (c. 2000-300 B.C.). Prior to the Late Preclassic period, the Maya Lowlands contained a scattered distribution of small autonomous villages adapted to riverine, lacustrine and coastal environments (Ball 1977a, 1977b, 1977c; Puleston n.d.:19; Puleston and Puleston 1971; Rice 1976; Willey 1977a:137). Social control and social differentiation were less well defined and developed than in later periods. The Early Classic period demonstrates a strong tendency toward social as well as spatial centralization with the advent of widespread public architecture, an overall population increase and a more elaborate settlement organization than found in previous periods. Greater stratification and social control are suggested by the planning, construction and maintenance of large "organizational centers" (Webster 1977).

Settlement pattern analysis in the Maya Lowlands has been critically reviewed by Haviland (1963, 1966), Fry (1969), Kurjack (1974), Puleston (1973, n.d.) and

Ashmore (n.d.). However, a brief discussion is warranted concerning those sites and areas known to contain Late Preclassic manifestations.

Two primary schools of thought have existed. The first argues that the settlement data indicate a loosely dispersed distribution of domestic mounded features (house mounds) throughout the lowlands. To these authors this suggests an unstratified, egalitarian social organization (Willey 1956; Sanders 1962, 1963).

Concentrations or clusters of mounded features are thought to be linked socially with "minor ceremonial centers" (Bullard 1960; Willey and Bullard 1965). Even a system of rotating cargos, analogous to that described by Cancian (1965) for present day Zinacantan, Chiapas, has been suggested as a mechanism for integrating ancient Maya communities (Vogt 1961). The proponents of this interpretation have suggested that the Maya were organized around vacant towns or ceremonial centers, perhaps similar to the concourse village described by Borhegyi (1956), in which highly scheduled marketing activities were conducted. These arguments appear to have developed from the notion that swidden agriculturalists were compelled to distribute themselves some distance from the ceremonial centers (Willey 1956). It should be noted that these authors have based their interpretations on data derived from Uaxactun (Ricketson and Ricketson

1937), the Chontalpa region of Tabasco (Sanders 1963) and the Belize Valley (Willey, et al. 1965).

In the last quarter century, a second interpretation has received support and increased popularity. It suggests that the ceremonial center might be better understood as an organizational or administrative center in which the sustaining population was less dispersed and was defined by an "extended town pattern" (Miles 1957). Shook and Proskouriakoff (1956) appear to have been the first to argue this approach, suggesting that the Maya Lowlands may have been substantially more densely populated than previously considered.

More recent investigations in the settlement zone at Tikal have argued for truly urban dimensions to some Late Classic Maya sites (Willey and Shimkin 1973). A revised population estimate for Tikal has been set at 49,000 during the Late Classic period, indicating a "nucleation tendency" (Haviland 1969, 1970). A program of survey and test excavations by the Tikal Sustaining Area Project has further strengthened this argument (Puleston 1973). These latter data suggest that there is a salient decrease in mounded features six to seven kilometers from the site's epicenter (Puleston 1974, n.d.). Seibal (Willey, et al. 1975; Tourtellot 1970, n.d.) has been interpreted in a similar light (Puleston commenting on Tourtellot's map, n.d.:11). In addition,

earthworks have been defined at Tikal to the north and southeast of the epicenter (Puleston and Callender 1967) corresponding to the drop-off in mound density during the Late Classic period (Puleston 1974). This suggests that the periphery of the site was consciously defined by the residents of Tikal. Puleston (1973) has proposed a figure closer to 80,000 people within this perimeter. It should be noted that the earthworks appear to have been constructed by the Early Classic period (Puleston and Callender 1967; Fry 1969; Puleston 1973).

Unfortunately, not all settlement pattern data can be neatly catalogued under one or another of these interpretations. Becan, in southeastern Campeche, is a fortified community with massive earthworks initially constructed by A.D. 100 (Ball and Andrews V 1978; Webster 1976). However, there appears to be little discernable decrease in mounded features outside the fortification (Thomas 1974). In contrast, at Altar de Sacrificios the settlement appears to be sparse outside the center (Smith 1972).

Kurjack's work (1974, 1976) at Dzibilchaltun suggests increased compaction of the elite resident population through time. Early Period elite structures are believed to be more scattered than in subsequent periods. Through an examination of the distribution of vaulted features, Kurjack has suggested that wealth and

energy investments were concentrated in a core zone of the site through time. Additionally, he suggests that there are concentrations of domestic structures surrounding larger mounded features. Similarly, Puleston has stated that plazuela groups at Tikal are represented by "a simple compaction of a basic pattern involving one or two groups and a surrounding vacant area" (n.d.:16).

Although a great deal of variability exists, a "dispersed-compact" pattern of settlement organization can generally be argued for the Maya Lowlands. This settlement design has received additional support in the recent literature relating to intensive agriculture as early as the Preclassic period (Matheny 1976; Puleston 1977; Freidel and Scarborough n.d.). This evidence suggests that large population aggregates could have been supported in the lowlands by employing these techniques. Ridged fields have been documented in the Candelaria Basin of southern Campeche (Siemens and Puleston 1972) and along the Rio Hondo of northern Belize (Belisle et al. 1977). Raised fields have been reported in Quintana Roo (Harrison 1977, 1978; Turner and Harrison 1978), along the Belize River of central Belize (Kirke 1980) and along the New River of northern Belize (Turner et al. 1980). Terraced fields have been reported in the Rio Bec region and in adjacent Quintana Roo (Turner 1974; Turner and Harrison 1978), as well as in the Cayo District of

central Belize (Thompson 1931; Lundell 1940; Healy et al. n.d.). Such technical advances reduce the significance of elaborate slash and burn subsistence equations for arriving at the carrying capacity of pre-Columbian populations.

The community organization and settlement system incorporated at each site must be seen in terms of specific economic and political conditions. Each community represents adaptations made to the local social and physical environment, although various regional traditions are fostered and reemphasized. Outside or intersite influences are accepted and manifest only if the community can tolerate their demands. The specialized adaptation made by one Late Preclassic settlement is the subject of this dissertation.

Cerros in Perspective

The settlement data from Cerros permit a specific statement about one type of pre-state community development. Residential population aggregates initially colonized Lowry's Bight, prior to the extensive land modification and civic construction completed by the end of the Late Preclassic period at Cerros. The residential population has been found to remain dense and increase through time, even though the civic architectural activity severely modified the landscape and forced a different residential adaptation to the site environment.

The growth of the community documents the transition from local resource dependency during its initial occupation to regional interaction of goods and services during its final occupation. The community developed from a principally residential locus to a well planned central place composed of civic monuments and residential space. The site reflects "synchorism" (Crumley 1976), the character of a center to manifest both civic attraction and residential aggregation, by the Tulix phase (50 B.C.-A.D. 150).

The adaptation of a community to a compacted settlement design with substantial civic construction by the Late Preclassic period has evolutionary implications. Previous research in the Maya Lowlands suggests that the "dispersed-compact" settlement adaptation was a recurrent adaptation made by later Classic period centers. The question then becomes; why did the Maya continue this settlement design for some 1500 years, given the complexity of their institutions and our knowledge of state development and social control from other areas? (See Krader 1968 and Service 1975; for the most comprehensive thesis addressing state formation using empirical data see Sanders, Parsons and Santley 1979).

Although Maya centers attained sizeable population aggregates and performed various "urban" functions, they seldom developed into cities in the manner of

nucleated residential and civic centers found in highland Mexico. This is not to say that the Maya were incapable of nucleated communities as evidenced by Mayapan (Pollock, et al. 1962) and Chunchucmil (Vlcek, et al. 1978). Agricultural constraints were no more severe in the lowlands than the highlands as indicated by the extensive raised field systems identified throughout the lowlands. Clearly the Maya were aware of nucleated urban organization and the advantages of population centralization for social control, but opted to maintain a more dispersed settlement design. Surely the environmental and organizational resources were available.

Given the elements of state formation in the Maya Lowlands, the Maya developed a "dispersed-compact" settlement pattern which allowed the control and regulation of these institutions. The dynamics of this system await further regional analysis.

CHAPTER II

INTRODUCTION TO THE SURVEY

The Maps

The rectification map of Cerros was rendered to permit intersite comparability, even though no standing architecture has been defined in the settlement zone (see Fig. 2). All form and orientation data have been derived from contour maps and excavation plans. The scale adopted for the published maps is identical to the Tikal and Dzibilchaltun site maps (Carr and Hazard 1961; Stuart, et al. 1979), two of the most ambitious and extensive mapping projects undertaken in the lowlands. The 1:2000 scale has been reduced from a series of 150 square hectare quadrat maps drafted at a 1:200 scale. Finished copies of these maps are not available at the present time, but the originals drafted on millimeter grid graph paper are on file at Southern Methodist University. These latter maps are contour maps of all mounded features encountered in the settlement, although depressions understood as being the result of land modification during the pre-Hispanic and early historic occupation of the site were also plotted. In addition, a selective range of environmental data were retrieved and plotted.

The rectification of the mounded features at Cerros conforms with the general practice at other Maya sites. Although landscape topography has been mapped, a general contour map superimposed over the rectification was decided against for two reasons. The first was purely a cosmetic decision to prevent clutter and distraction in reading the spatial disposition of structures. The other reason was to convey the exaggerated degree of flatness at Cerros when compared to other Maya settlements. It is believed that the relief manifest across the core area of Cerros can best be attributed to man-made land modification. This type of relief will be referred to as cultural relief in the body of this dissertation as opposed to the natural relief described outside the confines of the core area. The second map, the environmental map of Cerros, includes all contour relief.

The environmental map was rendered at the same scale as the rectification for comparability (see Fig. 3). In producing the rectification map certain interpretations were made as a result of not encountering any standing masonry. For this reason, it was decided that the structures for the environmental map should be presented as they were alidade and plane table mapped in the field. To reduce confusion, only the basal contours of the structures have been provided, although the absolute elevation of the mounds relative to their bases is noted

(see Appendix 1). These mounded features can be seen as truncated pyramids or as elongated variations of truncated pyramids in the case of range-like structures. It should be noted that in a few cases time and energy have permitted the lateral exposure of selected structures. In these cases we have reconstructed the form of the rectified structure from exposed excavation. This will become clear in the sections dealing with excavation, but on the rectification map it is most apparent on those structures which provide a degree of detail unlike adjacent mounds. Unless other reliable information has been available, the structures have been oriented to the north.

The environmental map has presented the general site contour at an interval of 0.5 meters. This interval was chosen to convey the subtleties in the hydrology at Cerros. The cultural relief at Cerros is perhaps even more pronounced than depicted in this environmental reconstruction, but the horizontal survey interval between points throughout the settlement was routinely 50 meters as a consequence of the thick vegetation cover. In addition to the elevational readings recorded in centimeters, the collection of types of vegetational cover and the use of aerial photographs (both 1:10000 and 1:1500 scales) have aided in the completion of the contour map.

Although the contour map might be best assessed in terms of hydrology and gradient cues, it is also one

of the variables necessary in the microenvironmental typology drawn from the survey data. The environmental zones defined on the environmental map have been given vegetational cover labels, but they reflect the soils, the elevation and the drainage patterns, as well as microclimatic differences (Wilken 1972).

The vegetation covering Lowry's Bight can be considered secondary or tertiary regrowth. Systematic survey, as well as reconnaissance methods, has demonstrated the presence of past hardwood logging operations throughout the peninsula. Milpa is still made in the interior of the bight along the flanks of the gentle slope of the low limestone crest, a kilometer or more from the organizational center of Cerros. Within the core zone as defined by the canal, as well as limited areas outside the canal, extensive bush cutting operations ten years ago provided the re-establishment of tertiary growth. This thick understory made survey operations doubly difficult because of poor visibility and accessibility. Nonetheless, an advantage to this seemingly inhospitable environment (an environment commented on by most researchers in northern Belize; Belisle et al. 1977 and Adams personal communication) may be its reflection of the types of regrowth the original occupants were forced to contend with at Cerros.

The location of points on either map can be readily obtained by using the alpha numeric grid coordinate system. To avoid cluttering the illustration, grid lines were not superimposed over the maps, but tick marks are provided along the margins for reference. Separate alpha numeric grid coordinates have been provided for the three transects that radiate from the main site quadrat block. These transects have been sequentially labelled: I represents the south/southwestern interior transect; II, the southeastern aguada transect; and III, the west/southwestern coastal transect. It should be noted that point locations for features in the transects must be referenced to the orientation of the transect and not to true north (see Fig. 4). In addition to point locations, each feature has been arbitrarily assigned a feature number which has been incorporated into all excavation provenience labels. These feature numbers appear on the rectification map.

A History of Methods

The methods employed at Cerros for the survey of the settlement represent a historical compromise between explicit theoretical propositions and pragmatic changes in the funding base. This is not to say that the data collected at the initiation of the survey is incomparable to that retrieved at a later date; on the contrary, we have retraced our steps when information appeared to be

lacking or incomparable in any way. The sketch that follows is provided to quell any doubts in regard to our systematic recovery of data.

As a consequence of the shoe string nature of financial support at the outset of the project, we were allowed to control only for the monumental architecture in the central precinct and what few ancillary structures might appear in a standard traverse closure with the corner of our main camp house defined as principle datum. The northwestern corner of the cement foundation is located S 46m E 10m in Quadrat 4E and arbitrarily defined at an elevation of 100.00 meters. Although the precise relationship of this datum to sea level has not been calculated, its proximity to the present Corozal Bay (14 m. south) suggests that it is approximately two meters above sea level. Our initial A-traverse encompassed a nine hectare unit with twenty permanent transit stations. From this traverse, two additional closed traverses were initiated. The D-traverse permitted the transit mapping of all monumental architecture on the main plaza, while the B-traverse allowed the inclusion of the then isolated pyramid Structure 29 on our preliminary map. A third line was established on the eastern side of the central precinct to better assess the mound density in this quarter of the settlement, but it was not properly closed.

In the formative seasons, the settlement was arbitrarily defined by employing unsystematic reconnaissance procedures to assess the spatial disposition of features. Brechas or bush trails were cut as lines of sight, but little systematic survey was undertaken. Only structures encountered on the brechas were cleared and transit mapped in their entirety. On the other hand, the central precinct resting on the main plaza was cleared and systematically surveyed and mapped. As a matter of priority, it was deemed necessary to have an accurate map of the main plaza should funding disappear. Although the rest of the site was eventually remapped, the central precinct as depicted on the 1:2000 scale maps has not been altered.

Upon evaluation of the excavations, within arbitrarily selected features in the settlement and the central precinct, we developed general theoretical statements as to the form and function of the site. The testing program demonstrated a formidable Late Preclassic component, with an ephemeral Early Classic and Late Postclassic occupation. Only minor constructional modifications could be assigned to these later periods, a proposition that is maintained to date. On grounds of sophistication and size, as well as artifactual inventory, Freidel posited a long-distance trading adaptation for the site.

In an attempt to further test the implications of the model, we initiated a systematic survey of the ruins at Cerros. In order to rationalize the obvious need for additional survey, a testable hypothesis was presented. If a trading adaptation was the primary focus of the site and the service community, then a tightly integrated support population would be anticipated. This would be manifest in terms of a compacted residential population and reflected in terms of structure density. The alternative to this pattern would be a dispersed settlement less well coordinated by a centralized trading economy. This pattern would be the result of social and economic constraints. Agricultural land use has been suggested as a key element in producing a dispersed residential pattern (Netting 1974, 1977; Sanders 1963).

The systematic survey was initiated from the main plaza and tied to the original A-traverse. A block of 72 hectares was surveyed to the immediate southwest, south and east of the central precinct. Upon subsequently stratifying the mounded features and test excavating a 16% or better sample, a clear Late Preclassic construction and occupation was established in the settlement. The service population, as defined by small mounded structures, appears to have been concentrated to the immediate east and south of the central precinct, although a greater area surrounding the site (as defined by the

72 square hectares) had to be surveyed before the spatial disposition of the service community could be adequately assessed. In addition, a 1200 meter long canal segment, circumscribing the major architecture in the settlement, was isolated. This feature is believed to have defined the limits of the core zone.

To better confirm or disconfirm the settlement compaction hypothesis, three transect blocks were established into the interior of the peninsula. Two of the transects radiate from a point at the south central edge of the main site quadrat block and the third runs along the southwestern edge of the shoreline. The overall effect of these survey transects was to ascertain the amount of compaction or dispersion in terms of mound density from the organizational center. However, each line provided discrete types of ancillary information. Although this additional 79 hectares of transect survey has not been test excavated, we have assumed a Preclassic date for these features for purposes of testing the compaction hypothesis (see Chapter VII).

Techniques

The techniques employed in the survey were derived from the pioneer work conducted by the Tikal Project (Carr and Hazard 1961; Puleston 1973). However, some necessary revisions were made to accommodate the dense understory found at Cerros. A 100 m^2 grid system oriented

to true north was established at the outset. Each hectare quadrat was defined by a one to two meter wide brechia cut as a line of sight for the transit survey. At the beginning, we tried to close each hectare unit to assure accuracy but as we gained confidence in the survey procedure this technique was altered in favor of a more rapid technique. Although closure occurred somewhat less periodically, this revised technique involved the cutting of over four times as many brechas as allowed by the old method. However, the manpower requirements were also increased. Where two men were sufficient in the initial technique, six were now necessary for maximum speed and efficiency. The technique simply called for the cutting of three lines simultaneously in the cardinal directions issuing from the transit station. Although the technique required the rapid reshooting of each line as the workmen chopped so as to maintain the proper bearing, this permitted a recurrent check equivalent to a back angle for each pair of lines. At every 50 meter interval, we staked and labelled the location for future ties. A point elevation was also taken. At every 100 meter interval, i.e. every transit station, we recorded the above information and also staked the location with a twelve inch section of concrete reinforcing rod. Staking with these rebar pins was found to be an absolute necessity due to the rapid deterioration of wooden stakes

after just one season. This permanent grid lay-out can be incorporated by future researchers as well. It should be noted that all distances were chained using a 50 meter metal tape.

Upon closure of a few hectare units, the next phase of the survey was promptly deployed. This entailed the most difficult aspect of the survey as a consequence of the rapidity at which it was necessarily conducted. Depending on the density of vegetation, four to five workmen were placed 10 to 15 meters apart between the transit station and a 50 meter stake. Each man then walked through the vegetation in a line parallel to the sides of the quadrat unit. Upon emerging on the opposite side of the quadrat, a report was made as to the approximate location of any mounded features, as well as related environmental data. The crew was then redirected through the other half of the hectare unit in a similar manner and received at the other side. At the initiation of this program, a man near the center of the survey crew was provided with a Brunton compass to maintain a proper bearing for himself and the others. However, this was not always necessary as the men were made to maintain their distance from one another by shouting and whistling as visibility was usually obscured. If the workmen were found to gravitate toward one another by the time they exited from the bush onto the opposite <u>brecha</u>, they were

asked to reenter the quadrat and search that ground believed to be insufficiently examined. Once a crew was trained to conduct this type of reconnaissance, all data recovery proceeded smoothly. In an attempt to control the quality of data recovered, we checked the coverage of two arbitrarily selected hectare units whenever a new crew was hired. This was deemed necessary due to the periodic rotation of our work force as a consequence of certain milpa duties. This check confirmed the efficiency of the technique employed as no additional mounded features were ever located on previously foot surveyed hectare units. In addition, to lessen the severity of "boundary effects" at the margin of our systematic survey area, we always examined the area immediately around a mound for a distance of 30 meters in radius from the summit of the structure.

The final phase of the survey involved the accurate location of the mounded structure and associated features as well as a complete alidade and plane table map of the mound dimensions. In the case of small mounds, two workmen were sent out to clear the entire platform, which was mapped at a scale of 1:10. Larger mounds entailed the cutting of radiating brechas issuing from the alidade station which was always the summit of the mound. A minimum of four lines of sight from one summit station were cut along the maximum length and width of

the mound. In the case of large range structures or complicated acropolises, it was necessary to establish as many as four summit stations. All large structures in the settlement were mapped at a 1:50 scale. Upon completion of the alidade contour map each mound was tied back to the nearest grid brecha stake by again cutting a line of sight to the trail. Once the grid brecha was intersected, it became an easy matter to measure the distance from the intercept back to the original transit survey stake.

The mound summit station for the alidade and plane table was also permanently staked for future excavation unit ties. All measurements were chained as a number of instruments were used during the course of the survey and stadia distance is always a less satisfactory procedure given the variability of telescope optics. Elevations were taken using a hardwood stadia rod calibrated to the nearest centimeter. All mounds were field map contoured at 10 centimeter intervals, but remapped on the 1:200 composite hectare grid maps in 0.5 meter contours.

Technical Problems

The survey at Cerros has striven for accuracy in the locational and dimensional data for the various features noted in the settlement. However, certain entropic factors were periodically isolated during the course of the project. The precision of our survey was

constantly challenged by the restricted visibility afforded by the dense semi-tropical forest setting. Large windfalls and standing hardwood trees repeatedly blocked sightings, to say nothing about the vines and thorn bush entanglements. However, we found that by raising or lowering the instrument height, a curve or notch in the obstruction would allow a clear line of sight for the necessary 100 meters between stations. This manipulation usually allowed for fewer stations and less chance for mechanical error.

Another problem attributable to the undergrowth is in the chaining of distances. Initially, we cut two meter wide <u>brechas</u>, but the utility of these swathes was less for a clear line of sight than for mobility along the <u>brechas</u>. As time limitations became more apparent, it was necessary to reduce the width of the <u>brechas</u>. As a consequence, the metal 50 meter chain became more difficult to wield. Stumps and branches seemed to attract the taut chain and some of the time saved by cutting narrower trails was offset by clearing them again. Perhaps the most difficult situations arose from attempting to close or check quadrats bordering surveyed units mapped in a previous season. Old lines could be immediately identified even without a compass bearing due to the thicker tertiary growth defining the original <u>brechas</u>. We did not reopen all of the lines

defining a hectare unit in these cases, although we did check some.

Another factor attributable to the setting was the unfirm, organic-rich topsoil floor into which the transit and tripod were anchored. The typical splayed root system of the tropics did not always form a secure foundation for a tripod. Besides the obvious problems with steel machetes affecting the compass needle, the necessity of threading our only chain between the extended legs of the transit tripod forced frequent checks on closure throughout the settlement survey.

Perhaps the most difficult factor in controlling the accuracy of the survey involves the significance of error inherent in the instrument. This coupled with human error produced a 5 meter horizontal discrepancy in the southwest corner of the main quadrat block during the most recent field season. The source of the error was not precisely determined, but it appears to be a result of comparing one season's survey work against another. It is believed to be a discrepancy in the setting of the declination between the two years. However, if, as it appears, our only error is this 5 meter difference across the 26 kilometers that have been grid line cut, then our precision has been astonishingly good.

The Definition of a Mounded Feature and the Role of Topography

The function of mounded features has received considerable attention over the years, particularly in the last decade and a half (Haviland 1963; Kurjack 1974; Puleston 1973; Thompson 1971). However, the simple identification of a mounded feature has received considerably less attention. A number of naturally occurring features resembling mounds have been located throughout the settlement at Cerros causing some confusion as to what constitutes an aboriginal activity platform. Those disturbances which could be identified as natural in origin received little more attention, but 14 mounds have been plotted on the settlement map whose origin cannot be determined without test excavations. In all cases, these problematic mounded features are 30 centimeters or less in elevation and unusually isolated from well-defined structure groups. The factors responsible for naturally occurring mounds at Cerros may certainly affect other sites in the subtropics. Some trees tend to mound soil through root and trunk growth. This upheaval is particularly difficult to distinguish from culturally prepared mounds if the tree or stump has disappeared. Another natural agent responsible for mounded features is insect activity. A number of ant species have the unsettling behavior of constructing large colonies using clay and

sand-size particles. Active colonies are all too easy to detect, but abandoned mounds are more difficult.

> Amongst geological agents mention should be made of the "wee-wee" ant that live in colonies and form mounds often 20 yards in diameter and several feet high. There is much earth excavation in making their homes and even soft rock is brought to the surface, but their main service is to allow surface water to penetrate lower. (Ower 1929:7)

The last factors to produce natural mounding are erosional agents which attack the soft limestone caprock and poorly secured vegetation during the bajo inundation and drainage flow of the rainy season. The effect of this erosion can produce a series of interconnected depressions or "potato holes" (Wright, et. al. 1959) with the associated high ground preserved by means of well anchored vegetation. The very slight natural relief at Cerros relative to other sites has prevented deeply incised arroyos and apparently permitted the meandering pattern of depressions so marked along the western transect. The end result of this erosion has sometimes confused our interpretation of a mounded feature.

The actual extent of this latter degradational agent has complicated some of the other cultural hypotheses generated for Cerros. It is argued that the degree of shallow landscape alteration in terms of most of the pits and runnels cannot be directly attributed to the process outlined above. The absence of a clear quarry site at Cerros coupled with the thinness of the caprock

formation suggests that much of the shallow relief is a result of deliberate and directed extensive caprock removal. Most of the relief within the canal is believed to be a consequence of this selective quarrying. The spatial organization of the community would suggest that the removal of the caprock and the resultant depression was as important as the location of the mounded complement. Outside the canal this relief is less patterned.

Although natural processes are responsible for some of the relief, much of it is believed to be the work of deliberate cultural caprock removal and only subsequently modified by erosional agents. This argument is predicated on the absence of similar rough relief outside a kilometer or better radius from the main plaza as defined by the 101.5 meter contour line. The slightly more elevated area of greater slope to the south of the site near the crest of the low ridge defining the spine of the peninsula would be expected to have been etched as severely as the lower ground surrounding the site. However, systematic survey and reconnaissance indicate this area to be very little affected by pits and scars of any kind.

Before leaving a discussion of relief outside the canal, it should be noted that preliminary side-looking airborne radar (SAR) readouts of the environs surrounding Cerros have been made available to me (courtesy of

Richard E. W. Adams) (see Fig. 5 and 6). These data indicate a system of inter-connecting depressions forming a lattice or dentritic network immediately outside the canal. This same network is apparent throughout the lower reaches of the New River and may be indicative of raised field intensive agriculture. The gilgae argument (Puleston 1973, 1978) can be reasonably dismissed in most of these settings due to the high year-round water table. The elevations presented on the contour map indicate the area immediately outside the canal could have been utilized for raised field agriculture in terms of gradient requirements.

One other factor necessary in any discussion of mounded features at Cerros must include the effects of recent historic land use modifications. Particularly evident are the scraper blade piles deposited by bulldozer action. Informants have indicated that the western quarter of the contiguous block defining the major site universe has been impacted by heavy equipment. In addition to two roads leading into the camp area, an airstrip and a sizeable reexcavated aboriginal rain water reservoir have been constructed. All of these features lay abandoned and reclaimed by the vegetation since the outset of the project. The precise extent of damage could not be assessed as the contractor responsible for the land modification would not reply to my inquiries. In a few

cases, it became difficult to discern what was formerly a mound, what remained a mound and what was a back dirt pile. This dilemma occurred in two instances and in each case a problematic mound designation has been assigned.

One other mounded feature which is poorly understood is indicated by the ridge running parallel to the coast in selective locations. It is most apparent to the immediate east of the center and again to the southwest outside the canal. This feature is believed to be the result of high winds and severe wave action during hurricane conditions (Simmons 1957). Although no excavation was carried out, the obvious mixed particle size would suggest such an origin for this feature. The curious trough immediately behind the feature is thought to be a run-off channel associated with the turbid high water trapped behind the ridge during the event. Although the eastern end of the canal seems to be connected into the canal course, it is believed to be a coincidental occurrence.

CHAPTER III

PHYSICAL ENVIRONMENT

The physical environment is a system of interacting components producing stable settings at various points in time. The major components are geological, climatological, biological, and cultural. Major subcomponents comprise each of these divisions.

Geology

The geological formation of the Maya Lowlands is relatively recent in origin. The Department of Peten, Guatemala, manifests folded and faulted Cretacious rocks underlying marine clastics and limestone of Tertiary age (West 1964; Maldonado-Koerdell 1964). The predominant east/west orientation of this relief is associated with Miocene events which are also in part responsible for the north/south down faulting of the Cayman Trough between the eastern Yucatan coast and Cuba. Although the Cayman or Bartlett Trough may have antecedents with the Old Antilla Trough (West 1964:38), the north-northeast/south-southwest trending fold and fault zone of northern Belize is understood to be a consequence of the Miocene activity (Hazelden 1973; McDonald 1979). The Hondo River, the New

River, and the Freshwater Creek define the course of this structural zone through northern Belize. The Maya Mountains of central and southern Belize, as well as the hill ranges of the southern Peten, are the most pronounced result of this orogeny. The granitic Cretaceous basement sediments are exposed throughout the Vaca plateau of central Belize.

The Yucatan peninsula is associated with similar Tertiary events. The Yucatan platform is argued to have slowly risen from south to north emerging from a shallow Pliocene sea (Maldonado-Koerdell 1964:22). Additional faulting separated it from Cuba early in time. Schuchert (1935) argued that the platform tilted northward and westward during the Pleistocene. The mechanism associated with this tilting action is not believed to be orogenic in nature.

> In the Peninsula of Yucatan, geologists of Petroleum Mexicana have added further evidence of geotectonic influences through discovery of an intrusive body in the subsurface of its northern coast under calcareous rocks of younger age. [Maldonado-Koerdell 1964:24]

This appears to be an intrusive replacement of the Old Antillan Foreland geosyncline of the region.

Wright et al. (1959) have indicated that northern Belize was a shallow water sea during the Cretaceous Period with siliceous sands eroding into the sea from the newly created Maya Mountain massif. Uplift in the Tertiary exposed the calcium carbonate rich sea floor

sediments with the overlying denuded sands rapidly eroding away. However, two ancient shoal-like areas emerged north of the Belize River in what is north central Belize. These islands are apparent on the soil-formation parent material maps (Wright et al. 1959) and represent remnant quartz sands redeposited from the Maya Mountains.

Ower (1929) states that the bulk of the dense white limestone platform dates to the Oligocene, but Wright et al. maintain that these chalks are Cretaceous or Eocene in origin. Hazelden (1973) and Flores (1952), on the other hand, see much of the limestone deposit in the New River and Freshwater Creek area as Mio-Pleistocene in date. Regardless, this limestone became indurated at its surface but has remained relatively unconsolidated at lower depths.

> Shoreline conditions in the North were similar to those found on the offshore cays today. On the Cays there is a surface crest of indurated white limestone containing corals and occasional mollusc shells. Below this is a scarcely consolidated cream coloured coral sand; this horizon is unconsolidated, and, at Corozal, the final emergence brought to light a very similar strip of unconsolidated rubbly chalk. Even today it is only slightly to moderately consolidated. [Wright et al. 1959:25]

The indurated white limestone which both Ower and Wright et al. make reference to is locally referred to as caprock and has its origin in caliche development. Although various partical sizes can be involved,

> . . . a thick, permeable, carbonate-rich sand will allow independent formation of a thick caliche if the climatic regimen fluctuates from humid to semi-arid

> and if the sand does not become plugged near the surface. [Reeves 1970:354]

The faulting or folding associated with the Tertiary appears to have produced the limestone tongues or bights of northern Belize. This fracturing produced a series of near parallel ridges and troughs running the length of northern Belize. (See McDonald 1979 for a discussion of the dynamics of this structural zone.) These fault lines are defined by a low scarp along the eastern edge of the ridges and a gentle slope to the west.

> The limetone tongues were almost certainly produced by faulting of the coastal shelf and associated with a gentle dip slope to the west. In the troughs that formed between the parallel tongues, silt, clay and typical lagoon sediments accumulated. These give rise to heavy grey clays - yet another type of soil parent material. [Wright et al. 1959:25]

On Lowry's Bight, our canal exposure revealed the nature of the caprock or indurated white limestone. Because the site rests on the western or gentle slope of the ridge, we believe that the underlying unconsolidated limestone is not as rich in coral fragments as the eastern scarp location. Our excavations in the canal, as well as a large extant sascabera or lime quarry exposed near the village of Chunox on the western side of the next eastern fault line, indicate that the matrices are a fine calcareous clay fraction intruded by few coral sands or gravels. This is explainable in terms of the location at which corals would indeed be most likely to grow, i.e. in the

most elevated ridge areas. This process has been described on the present day cays.

> The crests of these submarine ridges nowhere break the surface and their geological composition is unknown. The islands along the course of the submarine ridges are being formed by gradual accumulation of coral fragments. These are bound together on the leeward side by a cementing action which appears to be associated with movement of waves to and fro over the slowly accumulating strand of limestone sand and coral fragments. [Wright et al. 1959:28]

The resulting "cementing action" at this location is thought to account for the apparent graded grain size. The finer clay fraction would be expected downslope and west of the wave damaged sands and gravels defining the reef margins. This would also explain the apparent grain size differences reported at Corozal, located at the summit of one of these eastern crests associated with a fault line, and the proximity of our site lying only three kilometers to the southeast.

It should be noted that volcanic ash has been incorporated into the Pliocene chalks of Corozal and in the Cretaceous/Eocene limestones of Hillbank (a village in the northwestern portion of the country, not the ruin immediately south of Cerros on Freshwater Creek) (Wright et al. 1959:27). This subaqueous lensing represents reworked tuff deposited by ancient drainages and should not be confused with more recent events in the Guatemalan and Salvadorean Highlands, such as the violent eruption of Ilopango (Sheets 1979; Sharer 1974).

Siemens (1978:143) has suggested that the land reclamation associated with the emerging Yucatan platform indicates a similar recent phenomenon for northern Belize. However, a number of independent sources now suggest that this is probably not the case. The tilting of the Yucatan platform found most evident in the northwest portion of the peninsula may have the unsettling tendency of submerging the southeastern and eastern portions of the platform.

Evidence for land subsidence or sea level rise on the Belizean coast comes from three archaeological sources. Recent work on Moho Cay (located less than one kilometer north of Belize City) indicates Classic period workshop debris lying approximately one meter below the present sea level (Buhler personal communication; Healy 1980). Ower (1929) suggested that the mouth of the Belize River, which issues immediately north of Belize City, had been recently submerged producing its present truncated appearance.

A second source of information comes from two control pits excavated on what were formerly understood to be raised field platforms on Albion Island in northern Belize. Unlike Moho Cay, Albion Island rests in the path of the Hondo River well inland on the Mexican border. Antoine, Skarie and Bloom (n.d.) indicate that the water table has risen as a consequence of the retreat of the

Pleistocene glaciation but do state that the process was slowed about 2500 years ago. Their argument denying the presence of raised fields in their test area rests on the existence of a rising water table into the Classic, and probably Historic, periods. It is difficult to attribute this rise in water table solely to sea level transgression without further evidence. The alternative explanation for the depositional dynamics is land subsidence.

Eustatic changes in sea level over the last 4000 years have produced small, but significant, oscillations (Emery 1969; Bloom 1971). Block (1963) indicates an important rise in sea level beginning shortly before the Christian era and not ending until the 7th or 8th century, during which the sea level rose approximately 2.5 meters. Parsons and Denevan (1967:95) indicate that the construction of ridged fields in swamp settings of Surinam was made possible by the encroachment of the sea at circa A.D. 700.

The argument for sea level rise and/or land subsidence can be further supported by our work at Cerros (Freidel and Scarborough n.d.). We suggest that the mouth of the New River regressed up its channel which formerly emptied into a low energy lagoon environment. The proximity of the river to the site and the rapid erosional rate recorded along the Corozal Bay shoreline (10-20 in/yr, Belize Lands Department personal

communication) suggests that the main canal may have tapped into the New River. The shallowness of the bay may indicate a recent localized isostatic subsidence. Although the precise sediment load carried by the New River is unknown, the mouth of the channel has been periodically dredged to accommodate river barge traffic (Belize Sugar Industries, Ltd. personal communication). In addition, numerous tests within the central precinct of the site have isolated in situ cultural material well below the present water table. (A similar argument is presented for the submerged ridged and raised fields of the San Jorge Floodplain, Columbia) (Parsons and Bowen 1966:327).

The dense midden concentration associated with dark lacustrine clays and high frequencies of an associated shallow water, estuarine adapted snail (Melongena melongena identified by Anthony Andrews) suggests that the environmental setting at Cerros was considerably different from that of today. Judging from the present proximity of the numerous lagoons and salt marshes along the New River and Freshwater Creek, it is possible that Corozal Bay was formerly a constricted mouth lagoon.

In regard to drainage, Siemens (1976; 1978) indicates that the karstic nature of the Hondo River has allowed a "reservoir effect" in which seasonal precipitation fluctuations have not severely affected the water

level of the drainage. Apparently, the karstic terrain permits a slow-release discharge during both dry and wet seasons permitting a more even and continuous discharge rate than that found in most other drainages in Mesoamerica. This is of significance when examining the disposition of adjacent raised field complexes.

The soils in the Maya Lowlands have only recently received the attention they deserve. The Peten soils are a complex array of leached zonal soils with calcimorphic and hydromorphic intrazonal groups represented (Simmons, Tarano and Pinto 1959; Stevens 1964; Sanders 1977). These soils can be deep and well developed but tend to be viscous and acidic. The Yucatan platform is characterized by thin soils which are undergoing laterization, although those soils between Northern Yucatan and the Peten are more typically rendzina soils. Rendzina soils cover much of northern Belize, having experienced less leaching than soil further to the north. Rendzina soils contain a superabundance of calcium carbonate and, with the process of gleization, represent the general soil character of Quintana Roo, Mexico, and northern Belize.

The preceding geologic sketch has been presented to aid in understanding the origins and processes responsible for the topography and parent materials affecting Lowry's Bight and the adjacent areas. This background material will be referred to frequently in the course of

the dissertation. Before treating another major component of the environmental system, a further examination of a sub-component of the geology--the soils--will be discussed in further detail. Soils are inextricably tied to the other major components in the system, however, geologic processes are most influential in their final classification.

Soils

The soils of the Maya Lowlands are heterogeneous (Wiseman 1978), reflecting a diversity in microenvironmental settings. Although Meggers (1954) and Sanders (1977) suggest the inadequacy of the soils in the region, this is no longer a reasonable assertion (Altschuler 1958; Ferdon 1959; Stevens 1964; Sanchez and Buol 1975). It is true that some settings are less productive than others, but the implementation of sufficient drainage control and the selection of appropriate flora can permit an increased "agricultural potential" (Ferdon 1959; Denevan n.d.; Turner n.d.) far beyond the endemic conditions.

The soils of the Maya Lowlands include all three types of intrazonal classes, as well as leached zonal soils (following the U.S. Department of Agriculture 1960). On the Yucatan peninsula, the thin zonal soils are lateritic in some locations (Stevens 1964) but the severity of the condition is not as great as once believed

(Sanchez and Buol 1975). The effects of laterization in the Maya Lowlands is extensive, with some types of yellowish and reddish soils (tierra rosa) occurring as a consequence of iron sesquioxides (FE_2O_3) precipitating during the leaching process. Podzolization, unlike lateritic conditions, affects only the loose matrix overlying the parent material and appears to be a widespread process in the lowlands. This zonal process is significant in that in highly acidic humus horizons, this leaching will remove most metallic minerals, while silica (SiO_2) will precipitate out. This factor should be assessed in areas such as the Peten where acidity is high in the soils (see Deevey, et al. 1979 and Rice et al. n.d. for the significance of silica in assessing prehistoric land use patterns). At Cerros, the amount of silica precipitate is not great due to the basic condition of the soils.

One of the most naturally productive intrazonal soils is the calcimorphic rendzina soil. Stevens (1964) describes its distribution across the southern portion of the Yucatan peninsula and into the Peten and northern Belize. Wright et al. (1959) also indicate its wide distribution through northern Belize. Rendzina soils are superabundant in calcium due to the limestone parent material from which they are derived. This abundance permits the calcification process to take place in this relatively humid climate. These soils are rich in

minerals (except perhaps phosphates) and alkaline in chemistry allowing for the rigors of slash-and-burn agriculture.

Hydromorphic soils also appear throughout the lowlands characterized by high accumulations of organic matter with acidic conditions sometimes leading to podzolization.

> . . . The largest area of hydromorphic soils in Middle America lies in the swamp and marsh land region of Tabasco, extending in an irregular pattern into the inundatable part of the Peten. [Stevens 1964:287]

One of the more common processes affecting these soils is gleization in which a bluish-grey to yellowish-grey mottling occurs in the subsoil as a consequence of "the partial oxidation and reduction of iron caused by intermittent water-logging" (Jacks 1954:196). This process has affected the low-lying soils of northern Belize and is responsible for some of the post-depositional processes at work at Cerros. Specific reference can be made to the mottled grey clays within the canal system containing small percentages of limonite.

The third type of intrazonal soil is the halomorphic type. It is usually considered to be restricted to arid locations where insufficient rainfall and drainage present the periodic flushing of salts. Stagnant water coupled with high evaporation rates result in high salt concentrations. This situation can develop in littoral

locations where salt air and laterally migrating ground water can produce a higher than normal salt content. These factors coupled with infrequent hurricane inundation may explain the high salt content at Cerros. This is believed to be a post-abandonment phenomenon as canalization would have allowed a much more efficient drainage network than is presently available. The mangrove swamp area at Cerros and elsewhere has been most affected by halomorphic and hydromorphic soil processes.

The Cerros soils are more alkaline than those reported for depressed settings in the Peten (Lundell 1937; Puleston 1973) and as close by as Albion Island (Olson 1977) (approximately 50 kilometers south-southwest of Cerros). Although hurricane damage to Lowry's Bight is entirely possible, with the attendant effects of sea water, the elevated caprock exposure and outcrop at some locations suggest the presence of a high calcium carbonate reservoir affecting these readings.

The soil survey conducted by Wright et al. (1959) in Belize has provided the best single source of data on the soils of northern Belize. I will review only that material which directly influences the soil profiles on and around Lowry's Bight. The soils on which Cerros rests are termed <u>Remate</u> soils. These soils rest on the limestone caprock and are considered better drained than those of adjacent areas. They consist of red-brown clays

which fix phosphates making them insoluble for plant consumption.

> . . . In alkaline soils it (phosphate) is likely to be combined with calcium as a nearly insoluble compound . . . Finally it may adsorb on the surface of clay particles or become complexed with the clay minerals. [Cook and Heizer 1965:12]

The Xaibe clays appear similar in this phosphate deficiency, but both had adequate amounts of nitrogen and potassium. The darker Louisville soils which lie adjacent to Lowry's Bight are perhaps the best agricultural soils in the Corozal District, containing adequate phosphate for continuous corn production without fertilizer. The Pucte series is mentioned because the soils in isolated locations on Lowry's Bight resemble these grey waterlogged soils undergoing gleization, although Wright et al. do not define their distribution on the Bight. Soil crazing or cracking does not appear to be the problem here that it is for the Peten (Lundell 1934; Puleston 1973, 1978) due to the elevated water table, although the clay type may also lessen gilgae formation (see Antoine, Skarie and Bloom n.d. for discussion of 2:1 clays of Albion Island).

Soil textures of the area in proximity to Cerros are a consequence of differential weathering processes. Beach sands have affected the grain size at locations immediately adjacent to the shoreline, while silts and clays define points further inland along ancient river

courses. Free-draining sandy soils can be defined in areas of cocal (Cocos nucifera) growth as this tree crop requires well drained matrices. Most quantifiable textural analysis of the sediments of this area required thin-sectioning and particle counts because of the high percentage of calcium carbonate in the soil. Wet sieving cannot be performed without first removing the calcium carbonate which constitutes by weight the greatest particle fraction. Soil scientists have provided wet sieve grain size separation data (Antoine, Skarie and Bloom n.d.) but it must be considered skewed.

Wright et al. (1959) appear to concur with Morley (1956) and the Carnegie Institution Experiment Station (Steggerda 1941) in viewing the soils of the lowlands as adequate in nutrients for continuous milpa activity. It is the effects of weed invasion that are ultimately responsible for the necessary fallow period. This conclusion, however, is far from general consensus and is at best a minority opinion (Hester 1954; Cowgill 1962; Cowgill and Hutchinson 1963; Nye and Greenland 1960). Although most of the soils on Lowry's Bight are deficient in phosphates, mulching the crops will allow a slow release of phosphates thus insuring an adequate harvest (Wright et al. 1959:222).

Climatology

Many researchers have suggested that climate is the most telling component in producing the ecology of a region (Tosi 1964). The following sketch, however, will present only that information which directly pertains to the physical environment at Cerros. In the Koeppen system, northern Belize is classified as Amw' having a tropical rainy climate characterized by a dry period from February through April and a concentration of rain from June through September. The dry season is more predictable than the wet season (see Wright et al. 1959:21). It should be noted that the "Little Dry" (Wright et al. 1959:21) or August canicula drought (Hester 1954:23) in northern Yucatan can seriously disrupt crop growth, even though August is considered a wet month. Northern Belize is generally much drier than the rest of Belize. Rainfall is less than 1500 millimeters annually and, as is typical of tropical settings, the rainfall may fluctuate radically from year to year. The semi-tropical climate accommodates a mean annual humidity of approximately 80%, an average winter temperature of 23.9°C (75°F), and an average summer temperature of 27.2°C (81°F) (Hammond 1973:2). Annual temperatures do drop as low as 10°C (50°F)and rise above 37.8°C (100°F).

Precipitation is in part directed by the Southeasterly Trade Winds, although severe storms termed

"northers" or <u>nortes</u> bring cool, wet weather from a southward extension of the North American anticyclone system. Reflecting the course of the Southeasterlies are the nutrient enriched sea currents, with origins in the Venezuelan and Colombian Basins (Collier 1964). The upwelling of these currents off the Belizean Coast increases the nitrogen and phosphorous content of the coastal waters. Their effect on the fishing industry has been and still is significant.

Hurricane activity is not unusual off the Belizean coast and appears to have affected the flat, low-lying relief of Lowry's Bight. Hurricanes are most likely to hit during August or September.

> The climate of the region is greatly influenced by the hurricanes in the fall and the northers in the winter . . . The hurricanes which sweep inland are direly destructive to the vegetation. Large areas are mutilated as, for instance in September 1931, when a strip of the forest in British Honduras was destroyed from Belize inland to Cocquericot, a distance of about 45 miles. In such wide-spread destruction, the climax forest is destroyed and complex successional stages take its place. In some areas not a single large tree remains after the hurricane has passed. [Lundell 1934:216]

Biology

The biological, or natural, environment exerts the most immediate effect on the cultural component. Food, shelter and clothing are derived directly from the natural world and play a fundamental role in cultural development. The fauna of the Maya Lowlands and northern

Belize will not be systematically examined in this dissertation as this sub-component does not appear to greatly influence the other components in the environmental system at Cerros. However, this is an untested assertion which may warrant further examination, particularly when the role of microfossils is assessed (see below).

Flora

The vegetation of northern Belize is more akin to the semi-tropical rain forest formations found in the Peten than the dry evergreen formations suggested for the northern Yucatan peninsula. The vegetation of the Peten and northern Belize is best characterized by Holdridge's classification of Tropical Dry Forest (1960) or Beard's Deciduous Seasonal Forest (1944, 1955). Northern Belize does not possess a true tropical rain forest. "British Honduras lies somewhere between 'tropical and subtropical' categories" (Wright et al. 1959:29). Lundell refers to the Peten, and by extension northern Belize, as a "quasi-rain forest" (1937). This fits Wagner's characterization of a tropical rain forest because the Peten and northern Belize have more seasonal climatic regimes.

> The tropical rainforest grows in a hot, moist climate, with annual mean temperatures over 20°C and precipitation in excess of 1200 mm annually. The true tropical rain forest does not grow where rainfall is less than 50 mm in any one month, except where the annual total is above 2000 mm. This formation occupies deep, well-drained soils; it is less well developed where the soil is thin or subject to frequent inundation. [Wagner 1964:224]

The vegetation along the coast of northern Belize is also subject to seasonal swamp formations. The brackish water mangrove swamps (*Rhizophora mangle*) along the southwest survey *brecha* on Lowry's Bight are especially illustrative of this vegetation pattern. The extreme effects of salt air and brackish water inundation have complicated the vegetation cover of Lowry's Bight.

Two levels of plant succession are at work on much of the vegetation of the lowlands (Lundell 1934, 1937). The long-term primary succession which Charter (1941) and Wright (1959:31) outline suggests a slow development from broadleaf forest to savanna grasslands, as a consequence of progressive soil deterioration. This process may be accelerated when rapid and extensive modification of the vegetation occurs, exposing soils to excessive erosional damage. The more widely accepted successional series is grounded in a shorter term equilibrium state in which primary climax associations result in broadleaf dominants (Lundell 1934, 1937; Wagner 1964).

The second, more rapid, plant successional process is associated with the return of sub-climax vegetation, or that soil and drainage condition permitting the most developed plant community, following the extensive disruption of the primary vegetation. This secondary succession occurs on any milpa throughout the lowlands characterized by *acahual* or *huamil* consisting of dense brush or thickets.

> The succession (secondary) varies considerably from one area to another, depending on the manner of distribution and on the climatic and edaphic situation. In general, in the early stages the assemblage of plants in old clearings tend to include mostly species capable of wide dispersal and of rapid growth in open sunlight. Many of these are plants that also grow normally in stream beds, where natural disturbance is frequent. A great many are spread by animals. The progression in time is from low herb cover, approximating the weeds of cultivated fields, through a dense brush to thickets, often composed of a single species, with the slow accession of the usual forest trees to dominance if the site remains there after undisturbed. [Wagner 1964:232]

These two successional trends have interacted to produce the present vegetation cover of the lowlands. However, northern Belize is more strongly influenced than the Peten by the secondary successions due to the extensive land use modification it has undergone since the Conquest. When Cerros was constructed and occupied during the Late Preclassic period, the degree of soil deterioration had not accelerated to the degree presently apparent. However, huamil growth during and following construction of the site certainly demanded periodic clearing. It is likely that the setting was selectively culled of less useful vegetation to foster the growth and conservation of utilizeable wild and feral tree crops (Lundell 1937:10; Puleston 1973; Wiseman 1973). Such pollard trees provide shade from direct sunlight and shelter from rainfall. Even so, repeated encroachment of the jungle growth would have had a significant effect on spatial boundaries. This factor will be treated in more

detail when settlement patterns and boundary maintenance are examined.

The Environmental Interaction at Cerros

The environmental settings defined for Lowry's Bight and Cerros are derived from the systematic survey of approximately 16% of the bight, as well as by numerous reconnaissance ventures carried out around and through the bight. Soils data were obtained from twenty contexts across the site and subjected to chemical analysis. The high percentage of calcium carbonate prohibited physical analysis, except for "the field 'touch' test" (see Appendix B). Additional soil samples were compared to this control sample in terms of color, texture, structure and environmental setting in a less systematic manner. The definition of our environmental settings permitted comparisons with the soils maps of Wright et al. (1959).

The vegetation at Cerros was studied to better discern the soil types found on the bight, because extensive and detailed soils analysis was not possible. The defined microenvironments reflect the vegetation cover more closely than the actual soil types. The present microenvironments at Cerros, however, do reflect the varying degrees of soil degradation. Precise identification of the broad range of plant species within each microenvironment was not possible, but an extensive

representation of the dominant and subdominant species was made.

The ultimate identifications for the species list (Figure 1) were done by Robert Pott and Teodoro Martinez of Chunox village. For those who have worked in the lowlands, the concern and awareness of the Maya milpero for his environment and particularly for the vegetation is unquestioned, and the author developed identification skills through working with them. Years of experience and tradition have taught them to use the various vegetation and soil zones efficiently, given the shortcomings of slash-and-burn agriculture. The duration of the project has allowed the author to learn some of the complexities associated with the tropical forest. As Wright et al. (1959) state:

> . . . the process of familiarization with the component parts of the tropical forest is something that cannot be hurried; the information soaks in slowly and powers of observation develop slowly.

Both Bartlett (1936) and Lundell (1934, 1937) acknowledge the importance of the Maya informant, but both also stress the need to collect plants and ascribe proper species names. The Cerros Project was unable to collect and directly identify plants to the Linnean classification, but using the works of Bartlett (1936), Lundell (1934, 1937, 1938), Barrera et al. (1976), Wright et al. (1959) and Standley and Record (1936) the author was able to correlate the Maya or Spanish field name identification

with the Linnean classification. (Appendix D provides this information.) If the reader harbors doubts about this technique of identification, I have provided the accompanying quote from Cyrus L. Lundell (1934), perhaps the foremost authority on the botany of the Maya Lowlands.

> The writer fully agrees with Barlett (1936). Since 1928 ecological studies have been carried out, using the folk knowledge as a basis. The folk classification and nomenclature take into consideration (1) the physiographical areas, (2) the successional types of vegetation, and (3) the dominant species characterizing the associations . . .
>
> As an opening wedge in an unfamiliar region, no better method could be followed than to become acquainted with such folk nomenclature and classifications. And further, as Bartlett (1934:267) points out, much of this folk knowledge can be taken over and systematically formulated in an ecological study. (p. 267)

Before defining the microenvironments, the drainage patterns on Lowry's Bight should be mentioned. The bight is positioned within 15 kilometers of the mouths of the three principal exterior drainages for northern Belize. The New and Freshwater drainage avenues flank the peninsula and probably defined it in the past. The mouth of the Hondo River lies to the north. The absence of significant natural relief on the bight has been a major factor in determining the present appearance of the site. Some of the precipitation percolates into the groundwater systems, such as the savanna and <u>bajo</u> localities of standing water within the site area. It should be noted that in the site area the groundwater level

fluctuates as much as two meters between seasons as revealed in our canal exposures. Although some current movement is predictable, the major volume of water evaporates during the dry season. Severe erosion as a consequence of run-off is not a major problem on Lowry's Bight due to the flatness of the topography. However, slow infilling of depressed features is apparent throughout the settlement due to the immediate high ground that defines these depressions as well as the slight gradient from south/southeast (upslope) to north/northwest (downslope) across the bight.

I have defined five microenvironments within the 1.51 km^2 area systematically surveyed on Lowry's Bight. Detailed coverage for the remainder of the bight has not been collected, although aerial photographic coverage and reconnaissance surveys have permitted a less systematic identification of these settings. Two _bajo_ settings should be mentioned outside the systematic survey area. The first lies on the northeastern tip of the peninsula and appears to be a shallow doline closed off from Corozal Bay by mangrove reclamation and a possible hurricane ridge. This depression contains brackish water during most of the year. Although the north shore depression appears to be natural, it is quite shallow and informants suggest that it is recent in origin, perhaps as a consequence of the land base subsidence. The second _bajo_ area

outside the systematic survey area is an ancient river channel or course of the New River which formerly emptied into the shallow embayment due south of the intrasite area on the southeast side of Lowry's Bight. A concentration of Early Postclassic midden debris was located on the south levee at the mouth of this old drainage. This channel is readily traceable back to the New River terrace (on aerial photographs) at the northeast margin of the river's mouth. The presence of this drainage is peculiar in that it crosses the ridge defining the longitudinal axis of the bight and the crest of the earlier mentioned north/northeast south/southwest structural formation. Reconnaissance into this area indicated a possible shallow, vertical thrust block fault uplifted on the southwest side of the ancient channel. Such a geological event should have permitted the New River to meander in the manner described.

The most extensive microenvironment covering the systematic survey area is the <u>monte</u> <u>alto</u> and <u>huamil</u> setting. Wright et al. (1959) have defined this vegetation on Lowry's Bight as deciduous seasonal broadleaf forest rich in lime loving species, having a maximum canopy height of 50-70 feet. This setting is characterized by dark, slightly basic, well drained, friable loamy soils. These soils are thin and overlie the caprock formation. They occupy slightly elevated settings and

occur on or near plaza or mound space with the greatest frequency in the core area. These soils can best be summarized as rendzina soils and are Remate types in the Wright et al. (1959) classification. Although the term huamil usually refers to secondary growth within most any setting, Lowry's Bight has not accommodated large village aggregates in recent history. For this reason, the few milperos using the peninsula have been permitted to use the best, most fertile land without troubling to clear the less desirable poorly drained land. For Lowry's Bight, huamil can be considered synonymous with monte alto.

The next, most extensive microenvironment is the hulub bajo setting characterized by yaxom soils. It is nearly uninterrupted in its distribution along the eastern portion of the site. This setting is the most depressed in the settlement, excepting the aguadas and portions of the lowlying zacatal, containing 30-40 centimeters of viscous, organic rich clay overlying a viscous, compacted, mottled grey clay. Only our excavations in the main canal (OP116) have been taken down below the dry season water table in this setting. The basal sterile clean white sascab was located approximately two meters below the surface. These soils are not highly acidic due to a superabundance of $CaCO_3$ and do not appear to suffer from cracking, in part as a result of the high water table at

Cerros. These soils have undergone severe gleization and appear to have their closest affinity to the Pucte series; as defined by Wright et al. (1959). These soils have very high percentages of NaCl. It should be noted that numerous Pomacea flagellata have been collected from this setting, suggesting the poorly drained condition of these soils (Feldman n.d.). The dominant vegetation is hulub which is a subtype of the Tembladeral in Bartlett's 1936 classification. "This (tembladeral) is the wettest part of the bajo, and is avoided at all seasons since mules are likely to be mired in it and lost" (p. 23). Although this may be a slight overstatement of the Cerros soils, it certainly captures the spirit and condition of this microenvironment.

I have lumped a slightly better drained location (after Beard 1944:130) in with the typical hulub bajo setting at Cerros. This was done because of the difficulty I had in separating the two settings by vegetation. This setting is defined at the bajo fringe and is perhaps most similar to an intermediate association leading to a broadleaved climax forest. The dominant vegetation is huano and the location can be referred to as an huanal. This location has much in common with the escobal defined throughout the Peten by Lundell (1934, 1937) and more recently by Puleston (1973) and Siemens (1978).

In a very limited portion of the site, I have located grassland savanna or zacatal. The origin of this setting is unclear. Ten to fifteen years ago, a portion of the survey area was converted to pasture or potrero. It is possible that this area, which represents some of the most depressed and poorly drained land on the peninsula and is seasonally inundated by a meter or more of water, was affected. Although the vegetation cover is significantly different than in other areas, the soils appear to be similar to those defined in the hulub bajo setting. The thickness of the viscous compacted humic clay horizon ranges from 10 to 30 centimeters and is underlain by a viscous, compacted, mottled grey clay. The grasses, as well as the elevated water table, appear to prevent soil cracking. These soils have a basic pH and undergo severe seasonal waterlogging. The NaCl content is extremely high. These glei soils have a superabundance of $CaCO_3$ and a balanced proportion of other minerals except for a phosphate deficiency. Pomacea flagellata pervade the setting and have severely disrupted the stratigraphy (OP115, OP116, OP153).

A slightly more extensive microenvironment than that defined by the zacatal is the thorn scrub savanna (after Wiseman 1978). At the margins of the zacatal are the slightly better drained soils associated with this setting. Most of the known canalization at Cerros is

located in this microenvironment. The vegetation cover is dominated by muk, a most disagreeable bush. The soils are similar to those in the zacatal, although they have undergone less gleization. A thin A-horizon of loamy clays are underlain by viscous, compacted, mottled grey clays. The soils are charged with $CaCO_3$ having a high pH and, except for the phosphates, a suitable mineral matrix for most crops (OP151, OP152). Pomacea flagellata occur in this setting, but in lesser numbers. The NaCl content is again very high. This setting usually flanks monte alto/huamil and the most depressed setting in the settlement. It can be considered a transitional zone in terms of both vegetation and elevation.

A variation of the thorn scrub savanna setting occurs in a spotty distribution along the southwestern coastal brechas and most extensively surrounding the large Aguada 2. These areas appear to be better drained and higher in elevation than the low-lying thorn scrub savanna settings, although I have not closely examined these soils. However, the soils are understood to be quite thin, due to the exposure of the limestone caprock at some locations. "Potato holes" or diminutive solution channels have been noted in this setting. Katsim is the dominant thorn bush.

The final microenvironment at Cerros is the mangrove shoreline. This setting association can best be

understood as a river mouth association almost entirely defined by mangrove. The soil is typically entrapped beach sands. In the area surveyed it occupies a sporadic distribution along the southwestern brecha, but our reconnaissance by boat along the south side of the bight indicates a more continuous distribution. As is the case with most of the distributional settings defined at Cerros it is recent in origin, although it was certainly in proximity to the site prehistorically. This is supported in terms of the rich mollusca life which inhabit the mangrove swamps. Our core zone midden exposures have yet to produce the brackish water oyster which makes its home in the stilt root entanglement of the mangroves, but it is found in association with the Early Postclassic midden area on Esperanza Bight (on the south side of Lowry's Bight). The water table in the mangrove setting is subject to tidal fluctuations.

To summarize, I have attempted to correlate the known vegetation and drainage conditions within the survey area with the soils. This has emphasized the dynamic interplay between the various components in the physical environment today, but it will also permit a reconstruction of the past "cultural" environmental component. Three of the five microenvironments have undergone controlled soil analysis. The other two

settings are controlled by past studies carried out by Wright et al. (1959) on Lowry's Bight.

An Environmental Model

The above information has been provided as background for the first of three models to be developed in this dissertation. The microenvironmental information presented will not be argued to be the same as that existing 2000 years ago at the climax of Cerros' development. Also I will not suggest that regional climatic conditions have triggered the changes which do occur on Lowry's Bight (Raikes 1967:108). The present physical environment is understood to be a consequence of localized subsidence and cultural abandonment.

Cerros is argued to have been initially colonized by fisherfolk who rapidly adapted to an intensive commercial exchange system. The primal environment is argued to have been a lagoon-estuarine setting (Freidel 1979; Cliff n.d.). The site environment at that time is posited to have been more similar to the well drained monte alto setting defined throughout the survey area than the depressed, poorly drained environments. The vegetation would have been closer to climax than the present settings. This hypothesis is suggested on grounds that the initial residents at Cerros would have selected a well drained site for supplemental agricultural pursuits, as well as the broad-spectrum exploitation of mammals and tree

resources made available in this setting. The nucleated village midden debris associated with the earliest occupation at Cerros (Ixtabai phase) appears to support this hypothesis (Cliff personal communication) (see Appendix F). The well drained nature of this village is further supported by the presence of only ground level structures and the absence of any identified Pomacea flagellata from the midden (see below).

Exploitation of and adaptation to the forest resources is further suggested by the presence of an Ixtabai component at or near the large Aguada 2 located 1.5 kilometers south-southeast of the early nucleated village. A surface collection taken from the flanks of the aguada indicate the extensive use of the northern half of the basin. All identifiable sherds collected have been assigned to the Ixtabai phase (Robertson-Freidel, personal communication). If our freshwater lagoon-estuary reconstruction for the site is correct, then a freshwater supply from this aguada for the shoreline nucleated village would have been unnecessary. The amount and distribution of pottery collected from the rim of this aguada may suggest the presence of another Ixtabai community. It is suggested that these two communities would not have differed significantly in their formative adaptations to the environment. Only later would the geographic position of the lagoon-shoreline nucleated village have

permitted the preadaptation necessary for extended external relationships. It should be noted that not one mound has been discovered within 100 meters of the edge of this aguada, suggesting a further similarity to the ground level structures of the shoreline village.

During the next phase of construction and occupation at Cerros (Co'h phase) our settlement data suggest that the community underwent a residential transition (see Fig. 9). This pattern appears to be an extension of the well drained ground level compacted village arrangement best defined in the earlier Ixtabai phase. These structures rest on a steely blue alluvial clay and cluster around the central precinct. It will be shown that these Co'h phase residents best reflect an infield/outfield agricultural settlement system. The environment during this period is hypothesized to have been similar to that defined for Ixtabai times but with kitchen gardens and the creation of an artificial rain forest (Wiseman n.d., 1978; Lundell 1937:11; Geertz 1963) within the confines of the site. The soils and the vegetation are believed to have characterized a well drained setting. This is supported partially by the absence of Pomacea flagellata from any archaeological context associated with this or any other phase within the Late Preclassic period at Cerros. Considering the frequency of this gastropod at a similar time at other sites in northern Belize

(Feldman n.d.) and the apparent relish for this species by Late Preclassic Maya (see Cuello, Donaghey et al. 1979:26), its total absence at Cerros is peculiar. From this, I would suggest that the site was well drained until its Late Preclassic abandonment.

Late in the Co'h phase there appears to have been a further change in the settlement pattern and agricultural base. It is at this time that the main canal was excavated around the site and that the concentration of mounded features was constructed. Structure 76 at the margin of aguada 1 was erected, as were additional structures clustered around and overlying the earlier ground level Co'h phase residences. The canal and aguada fill is thought to have been used in the construction of these structures. It is with the initiation of the canal that the Cerros community experienced the most significant environmental transition in its history. However, as will be demonstrated below, the main canal was not solely a drainage device. Most of the monumental architecture had not yet been erected and little extensive quarrying had been initiated.

During the Tulix phase the previous well drained setting was significantly altered (see Fig. 10). The major construction in the central precinct occurred, as well as the construction or reuse of over 97% of the plaza and structure space defined on the present

settlement map, including Structure 29 and the two ball-courts (Structure Groups 61 and 50). Raised plaza space occurs throughout the settlement capping earlier Co'h phase structures. Complimenting this construction of monumental architecture is the system of depressions resulting from the necessary quarrying activities. This is readily apparent from our contour map (see Fig. 10).

The environment at this time is not understood to be a seasonally drained setting, but a perennial watershed controlled by a system of sills, or dikes, and canalization. Formal irrigation, short of pot irrigation, cannot be supported at the present time. However, our speculative arguments in favor of controlled irrigation (Freidel and Scarborough n.d.) have not been challenged by laboratory analysis. Confirmation or disconfirmation of this hypothesis can only be determined by discrete field data collection.

The soils and vegetation during the Tulix phase are understood to have been well drained. Most of the setting was artificially altered to produce a truly "cultural relief" having tremendous agricultural potential. The poor condition of the present soils are understood to be in no way a reflection of their original fertility.

Since my 1980 paper (Freidel and Scarborough), few researchers have quibbled with the formal definition

of raised fields and canalization at Cerros. In that article, it is stated that the fields were most likely drained seasonally to accommodate wet season intensive agriculture. However, the canal itself could not have contained the anticipated run-off from the intrasite area alone. The known dimensions of the main canal are two meters in depth, six meters in width and 1200 meters in length, which would have provided a 14,400 cubic meter catchment volume for draining the site area. There are 37 hectares or 370,000 square meters within the confines of the site as defined by the main canal perimeter. If only this area were drained by the canal (and our contour map would indicate a much more extensive drainage system) it would take less than five centimeters of run-off across this area to immediately fill and overflow the canal. Wright et al. (1959:17) state: "Falls of rain are often of an intense kind; 5 inches in 24 hours is experienced not infrequently." The exposed impermeable clays underlying the quarried caprock, as well as the exposed lower and more dense caprock, allow little absorption of precipitation. Cowgill and Hutchinson (1963:20) indicate that only 20% of the run-off into the Bajo de Santa Fe is absorbed by the soil. However, the large depression near the center of the core zone, as well as the known and hypothesized feeder canals across the site, would have held a large amount of water. The severity of

flooding at Cerros was most clearly appreciated in July of 1976 when stagnant chest high water levels were negotiated when traversing the 99.5 meter contour interval through the settlement. Only a well managed system of hydraulic control could have reduced the damage to soils, to say nothing of household disruptions as a consequence of this high water. In addition, the Tulix phase settlement appears to have been constructed from a preconceived general plan. Together the great arc of the main canal (Freidel and Scarborough n.d.; Scarborough n.d.), the central precinct, the position of the ballcourts along a north/south axis of the site and their relationship to Structure 29 (Scarborough, Mitchum, Carr and Freidel n.d.) suggest a sophisticated degree of symmetry (see Fig. 13). This plan had been initiated by the end of the Co'h phase but only was taken to completion by the end of the Tulix phase. Judging from the patterned arrangement of features generally, it is suggested that the location and control over quarrying activities was carefully regulated to permit the subsequent use of these depressions for water manipulation projects.

The amount of fill necessary to construct the limestone rubble core supporting the bulk of the structures at Cerros has been calculated to be 226,395 m^3 (see Appendix 1). This fill could have been obtained locally if most of the two meter thick caprock were removed back

to the 101.5 meter contour surrounding the site. This contour break corresponds to the approximate location at which the pocked and pitted caprock defining the impacted site area changes to a more level and flat topography. After reviewing the geology of northern Belize, Hazelden (1973) states:

> The Maya seem to have used only very local stone for building, perhaps quarried on the site itself. Evidence of this is seen 100 meters east of Plaza C at San Estevan. No great lengths were gone to in obtaining building stone, even if the effort involved in carrying better quality stone from a short distance would have been very small. The emphasis seems to have been on obtaining the stone from as close to the site of building as was feasible. (p. 85)

Although the caprock at Cerros may have undulated slightly across the settlement and its thickness may have varied slightly, our exposure of its thickness in the main canal profile will be used as an approximate figure for its proportions across the settlement. Reeves (1970) has indicated that:

> Fine bedded lacustrine clays tend to impart bedding to the caliche and to restrict infiltration; thus bedding, an absence of carbonate nodules, and rapid formation of an upper laminated zone are characteristic of caliche formed on clays or shales. (p. 358)

It is suggested that the fine particle fraction and clay size cement underlying the caprock permitted a continuous bedding plane for the caprock on Lowry's Bight. Further support for the homogeneous bedding of the caprock is suggested by the absence of carbonate nodules in the matrix. Reeves continues:

> There are undoubtedly several different types of structures found in thick caliche profiles, some formed by expansion or contraction due to various reasons, some formed by solution and settling, some even being structures which antedate formation of the caliche. <u>However, large caliche structures are not typical of caliche profiles and represent very local effects</u> . . . the type of structures that form in caliche is the combined result of the parent sediments, amount of carbonate, the vegetation, the climatic environment, and the time or extent of caliche formation. (pp. 358-9) (Emphasis added)

I submit that all of these factors were relatively the same across the bight and that the caliche or caprock deposit can be considered homogeneous except where quarried. It should be noted that the fill for the monumental architecture was not taken from under raised plaza and structure space. This has been demonstrated repeatedly in our house mound testing program and may suggest the planned nature of the settlement. In determining the amount of fill available, this area has been subtracted from the total (see Appendix A).

As indicated above, Ixtabai and Co'h phase residential structures appear to cluster around the main plaza and precinct center with most dwellings resting on alluvial clays. Our exposures indicate that these clays, in turn, rest upon a sterile yellowish granular <u>sascab</u>. It is not believed that the caprock was removed from these locations, but rather, it has been resorbed by the rising water table associated with subsidence. The alluvial clays were deposited by the New River before the site was occupied as indicated by the absence of any

cultural debris associated with them. The restricted shoreline distribution of these alluvial sediments reveal the northern course of the river and may suggest that the New River had been regressing up its mouth sometime before the site was colonized. Again this area was not considered in arriving at the total quarry area.

The major source of error in determining the fill volume for the site comes from the eroded shoreline. The eastern portion of the site appears to have weathered less than the western portion of the site. Cliff (n.d.) argues for the presence of a docking facility immediately east of the central precinct while the western shoreline of the site is littered with eroded cultural debris and plagued with shallow lying limestone chunks trailing 100 meters into the bay. Although beach rock formations (Russell 1969) do occur along this coast, it is suggested that the lateral extent of this limestone is a better reflection of the inundation of small structures than the result of natural agents. The extent of the fill error is in part balanced by the incalculable mass of these small structures.

Because of the ubiquitous and apparently continuous distribution of caprock outside the culturally impacted area, it is suggested that the residents of the Tulix phase systematically quarried away more than 266,309 cubic meters of caprock within the 100.5 meter

contour above. Although some areas were not completely excavated of caprock, so as to maintain and define the course of channels and canals (as was the case of the main canal), other areas were extensively quarried down below the sterile clean white _sascab_ level. This appears to have been the case within the _zacatal_ in the center of the core area, where the surface contours indicate a meter less fill in this depression than the main canal. (If the amount and rate of sedimentation in the two contexts can be presumed to be similar, then the _zacatal_ is a meter greater in depth.) The above figure can only be seen as a loose approximation given the assumptions present.

As already indicated the site environment was unlike its present appearance. However, the present setting can tell us something about the past environs. The extensive presence of _yaxom_ or _bajo_ soils and accompanying vegetation indicate a great deal of sedimentation from the adjacent high ground. The _zacatal_ setting appears to have undergone perhaps the most silting in the settlement. The bulk of these denuded blocky clays are thought to have eroded from an extensive raised field complex which would have collapsed into the more depressed locations within the site. There is little dispute that _bajo_ settings throughout the lowlands have undergone substantial infilling from the mass wasting of adjacent

well drained rendzina soils (Lundell 1937:89; Ricketson 1937:11; Cowgill and Hutchinson 1963:274). In the case of Cerros, some of the fill has found its way in from the adjacent crest running through Lowry's Bight, but the relief from the spine of this ridge to the edge of Corozal Bay is less than six meters over a distance of 1.5 kilometers. This sedimentation has affected the perimeter of the site outside the canal much more than the core area of the site. This is suggested by the presence of numerous depressions which are only partially infilled. For this reason, the bulk of the sediments within the core area defined by the main canal are wasting from plaza margins and the more friable field platforms. The depth of these sediments can only be assessed in our canal exposures which indicate more than a 1.5 meter deep deposit of clay and silt.

The six microenvironments defined on the peninsula can be lumped into three major soil and drainage groups reflecting the original drainage of Tulix phase Cerros. The low-lying hulub bajo and zacatal reveal the quarrying locations and canal system. The elevated well-drained monte alto/huamil (as well as the elevated thorn scrub savanna) define the original caprock surface or raised "cultural relief." The thorn scrub savanna and the huanal (a less well defined subdivision of the hulub bajo resting at the bajo fringe) mark the transition zone

between high and low ground. Generally, in computing the area effectively quarried, only the hulub bajo and zacatal settings have been considered. Although some of the thorn scrub savanna setting has been impacted by caprock removal (OP152), other similar settings have been less affected. At any rate, some of this error has been compensated by the inclusion of the huanal or bajo fringe in the quarry area figure.

Quarrying the caprock for mound fill and channeling water for agricultural purposes were not the only benefits obtainable from this landscape modification. Lime rich sascab clays would have been exposed and perhaps mixed with the more loamy rendzinas or the more distant beach sands to produce the foundations for the raised platforms (after Hester 1954:82; see Serpenti 1965:41 for ethnographic analogy). For corn production some experiments indicate phosphate requirements are reduced significantly when lime has been added to phosphate deficient soils (Soil Science Department 1978:130). (Urrutia, however, indicates that liming phosphate deficient soils is only effective if the soils have an acidic nature) (1967:26). Turner et al. (1980) have suggested the presence of such an intensive reworking of the soils by Late Preclassic times in the Pulltrouser swamp area located approximately 30 kilometers south of Cerros.

Land Use Potential

Judging from the planned spatial organization of the settlement at Cerros, it is argued that the site was selected carefully for environmental as well as geographic considerations during the Tulix phase. The trading posture of the community has been outlined by Freidel (1977, 1978) and discussed by myself (1978). However, the agricultural potential of the site has received little attention. The conversion of the site from natural topographic relief to the complicated cultural landscape during the Tulix phase must be considered in socioeconomic terms. Simple drainage of the natural setting can hardly be seen as a cause for the extensive quarrying, given the postulated well drained setting at the outset of occupation. Monument construction was a major force behind quarrying the site, but the excavation of the main canal appears to antedate the major monuments by at least 100 years (Robertson-Freidel personal communication). The initial construction of the main canal would appear to have been for reasons other than drainage or monument fill.

Irrigation or the control of a year-round water flow system can be argued, but the detailed tests to support this thesis have not been performed. The extremely high salt content throughout the site and especially in the fields (see Jacobson and Adams 1958),

coupled with the very poorly drained clays occupying the eastern quarter of the site in the location most likely to receive the fine particle fraction in a west to east irrigation flow (after Gibson 1974:10), might suggest a worn out prehistoric irrigation system, but other explanations can be made. Our molluscan data can only be viewed as equivocal (see Appendix 3), and our soils analysis must be refined. Even the apparent downslope west to east gradient of the main canal can be argued to be a restricted drainage feature designed with a system of sills (the check dam-like features) to produce a rather elaborate catchment reservoir servicing the entire site (see Hauck 1973). Although the initial canal excavation cannot be demonstrated empirically to have functioned as an irrigation canal, it must have facilitated communications across the site regardless of its other uses. Canoe traffic has been demonstrated elsewhere from the Late Preclassic period (Connor 1973) and strongly stated for Cerros (Freidel 1978).

The exact nature of the transition from Co'h phase to Tulix phase is not clear, but it is argued that at least the core site area was partially covered at this later time by a controlled water level. Whether it was a permanent well flushed system regulated by the stable water level of the New River (see p. 8) or a seasonal runoff system, perhaps internally drained within the

core area as defined by the main canal perimeter, communication and intrasite exchange are suggested to have been facilitated by an elaborate, though poorly understood, system of waterways (see Fig. 3). If the man-made seasonal watershed argument is made, then a system of dikes and sills would have been necessary to control the flow of wet season as well as dry season reservoirs. The impermeable clays at the basal reaches of the canals would retain most of the water, preventing the vertical percolation of moisture. Evaporation retarding plants (after Stephens 1843; Puleston 1977; Matheny 1978; Freidel and Scarborough n.d.) may have further conserved water levels although the humidity would have always been quite high (see p. 14).

Neither of the above settings account for the postulated subsidence on Lowry's Bight. Although the poorly drained internal catchment defining the core site area at Cerros may collect a meter and a half of standing water today, it would have been much different if the entire site were raised a meter and a half and allowed to drain into the postulated lagoon. Still, dry season catchment basins would have been maintained in the seasonal watershed system. The irrigation argument would not be affected, given the certainty of our information.

Although raised fields, or earthen platforms, have been defined within the core site area, their

elaborate form and orientation, as well as the presence of cultural debris and high phosphate concentrations more than 60 meters from the nearest mounded feature, may suggest ground level residential loci. The prospect that the fields were fertilized and mulched using household trash from other locations within the settlement has been postulated elsewhere (Freidel and Scarborough n.d.), but the large size of the sherds may suggest primary deposition on well drained kitchen gardens. The ground level occupation characterized by Ixtabai and Co'h phases coupled with the square-like shape of the Tulix phase raised field loci identified inside the main canal may argue for a residential function for these features.

In addition to the elaborate form of these earthen platforms (mounded sascab and stone buttressed platform sides), the square-like shape of the features is somewhat unusual when compared to raised, ridged and ditched fields elsewhere in the world, although the variability would permit the inclusion of our features in these settings (see Denevan 1966, 1970, n.d.; Denevan and Turner 1974; Parson and Denevan 1967; Serpenti 1964). The length to width ratio of our features approaches one, suggesting that simple pot irrigation and the dredging of organic matter for fertilizer are not the whole story. The more narrow the field, the easier it is to tend a crop dependent on canal supplies. By widening the

platform, one increases the distance one must carry water to the interior of the plot. If this is considered a less efficient agricultural adjustment then at least another cultural component enters the description. I suggest that a household would have such an effect. The area of our largest field plot is sufficient to accommodate one family and adjacent garden space, using an analogy to the space requirements of a family in the nearby village of Chunox (Mitchum n.d.).

I am in no way suggesting that every raised field defined in the Maya Lowlands was a household locus. However, I will assert that some of them were used for household residences (see Calnek 1972 for Tenochtitlan example). Such a system may have allowed the efficient rotation of the household over a restricted field plot area. This would have permitted kitchen midden debris to enrich an abandoned housesite, while the new residence could be relocated to an exhausted fallow plot. The life expectancy of a thatched house is 30 years (Wauchope 1938) at which time the house is overrun by insect pests and wood rot.

Adhering to Freidel's model of trade, it is posited that commercial, as well as social interaction, rested upon maritime exchange. At the intrasite level of analysis, the site is thought to have been a floating garden city during the wet season and during at least a

portion of the dry season. If the settlement dried out from February through May, a system of high ground would have connected all public and private space. This is best illustrated by the 210 meter long Sacbe 1 extending from the large plazuela Structure Group 10 to the ball-court Structure Group 50 which traverses the most depressed zacatal terrain in the settlement.

During the wet season and perhaps during a portion of the dry season the main canal is believed to have made maritime traffic possible to many points in the settlement. The greater depth of the main canal would allow larger canoes access to interior locations and shallow draft dugouts may have been able to venture around the site even during the dry season. I have suggested elsewhere (Freidel and Scarborough n.d.) that some of the causeways or check dam-like features bridging the main canal were utilized by the Late Preclassic occupants of the site, but I would revise that hypothesis and suggest that they are Early Classic or later in origin. Our single cross-section through one of these features (OP116) indicates that it is later in time, following the abandonment of the Late Preclassic occupation at Cerros. The kind of drainage system envisioned at Cerros is perhaps hinted at by Denevan (1966) in his discussion of the chiefdoms of Mojos in northern Bolivia.

> For all forms of life the most significant changes in the landscape are not the semipermanent and unusual ones, but rather the regular seasonal changes. During the wet summer, rainfall is plentiful and the vegetation is verdant; but as the season progresses the pampas are converted into vast marshes dotted with scattered islands and sinuous bands of gallery forest. Great flocks of bright-colored birds fly overhead and fish come out of the rivers and swarm over the flooded llanos. Terrestrial life, including man, seeks the high ground but also of necessity becomes amphibious. (p. 18)

> While causeways facilitated foot travel during periods of flooding, they did not have the utility of watercraft or transporting food, belongings, and fuel. When flood waters rose to a height of several feet on the pampas, canoes could travel unhindered cross-country over vast seas of water. (p. 73)

> During the dry season everything changes. The marshes first become muddy and are filled with stagnant pools, rotting dead fish, and rank grasses; and then they dry out completely. Rains are infrequent, many trees lose their leaves, the grasses turn brown, and the clay soils crack. The serial view is one of tall pampa grasses, scattered scrub trees and palms, and forest patches. The bajios and small rivers dry up, but the shallow, rectangular lakes persist. The trails become dusty, and grass fires fill the sky with smoke. The aspect is one of bleak grayness and aridity . . . For the traveler who has seen the llanos during flooding it is disconcerting to return in August and find water being brought many miles by oxcart to be sold in town and to see canoes tied up to the hitching post of a ranch house with the nearest body of water many miles away. (p. 18)

The major challenge to this description for the Cerros setting is the resultant reservoirs of stagnant water throughout the settlement. This factor would have allowed the growth of insect pests unless the system were periodically flushed or predatory fish were made to occupy such ponds (Cooke 1931). The latter possibility

would have also provided a welcome source of protein (see Thompson 1974; Puleston 1977).

The size of the mounded structures and the elevated plaza space at Cerros relative to other Late Preclassic communities (i.e. Komchen; see Andrews V n.d.) may suggest, in part, the annual high water levels to which the settlement was exposed. Although mounded space reflected permanent social space, it may have been exaggerated at Cerros as a consequence of the seasonal water levels. A pattern which has emerged from the settlement testing program is the presence of a "preparatory surface" or ground level house floor underlying most of the larger and more complicated structures. Many of these underlying floors are associated with Co'h phase debris and may reflect the changing water control at Cerros.

Except for the fields along the first river terrace at the southwest end of our shoreline traverse, most of the agricultural activity on the bight is postulated immediately outside the canal within the 102.5 meter contour. Unfortunately, the vegetation and sedimentation in the hulub bajo area has severely impaired the definition of these predicted features. However, the area to the east of the main canal has provided some suggestive contours in an area devoid of structures. It should be noted that the SAR readout provided by R. E. W. Adams indicates that these areas reflect a dendritic or lattice

patterning (see Fig. 6). This pattern occurs throughout the first river terrace of both the New River and Freshwater Creek and closely resembles the embanked and irregular field design of Lake Titicaca (Smith et al. 1968:358).

The evidence to date does not support extensive agricultural production inside the core site area. I suggest that intensive agriculture was not carried out within this area except for kitchen gardens. The very depressed elevations found in the centrally located core site zacatal indicate that the necessary raised field platform fill was never available. There is not enough wasted sediment in the depression to argue for adjacent raised fields if the elevation of the four raised features already defined is a reflection of the water levels involved. The elite and their retainers are argued to occupy the core site area, while the bulk of the population resided around the raised field complex outside the main canal.

As Denevan (1966) has indicated for the savanna settings of northern Bolivia, the main reasons given for not cropping the present depressions are low fertility, poor drainage, clay pans and grass competition. Except for clay pans, these conditions pervade the Cerros setting of today. Whether the fields at Cerros were irrigated by a perennial high flowing water table or subject to

seasonal drainage, the field construction would have been adaptable to either system.

CHAPTER IV

SETTLEMENT EXCAVATIONS

From a theoretical point of view, the focus of the survey has been on spatial variability within and between mound groups, relative to the central precinct. To deal with this variability, a working morphological typology of mounded features using form, size and groupings was devised for the settlement zone in 1977. (The volume of each mound was calculated in an attempt to determine the relative amount of energy expended in the construction of these structures.) Tables I and II present this preliminary classification which was developed, in part, because of the absence of masonry architecture in the settlement. It deals only with the data collected during the 1974-1978 seasons and is limited to mounds within the 75 hectares immediately surrounding the center (see Fig. 4).

This typology was used to stratify the known sample of mounds around the center and to provide the basis for selecting particular mounds for excavation. It was argued that the size of these mounds (reflected by their respective volumes) would be correlated with the status of the occupants. Even if the resident was not

TABLE I

STRUCTURE TYPES IN THE SYSTEMATICALLY SURVEYED AND EXCAVATED SETTLEMENT AREA

Type	Description	Frequency
1	4 or more building platforms on a shared substructure	2
2	3 building platforms on a shared substructure	4
3	2 building platforms on a shared substructure	4
4	Substructure greater than 150 m^2 and more than 1 m. high	18
5	Substructure greater than 150 m^2 and less than or equal to 1 m. high	27
6	Substructure less than 150 m^2 and less than or equal to 1 m. high	32

TABLE II

STRUCTURE TYPE FREQUENCY AND EXPOSURE IN SYSTEMATICALLY SURVEYED AND EXCAVATED SETTLEMENT AREA

Type	Frequency	Number Tested	Percentage Tested	Total Exposure/Stratum
1	2	2	100	451 square meters
2	4	4	100	269 square meters
3	4	3	75	101 square meters*
4	18	13	72	82 square meters
5	27	6	22	73 square meters
6	32	5	16	20 square meters

*Excludes extensive exposure on Structure 29B.

directly responsible for the initial construction of the mound, his ability to elevate himself above another in terms of occupying a larger or more complicated mound grouping would indicate his rank in the community. Intrasite distance relationships were also expected to reflect elements of social organization related to the clustering of mound groups (see Kurjack 1974, 1976).

Underlying this typology was the implicit assumption that the majority of mounds served a residential function. However, more recent information collected during the 1978 and 1979 seasons suggests that this assumption must be reevaluated. Most of the large and formally complex mounds within the area defined by the main canal area are considered to be civic monuments. Although the functional justification for stratifying the mound excavation sample must be reassessed, the typology still stands on formal grounds and may prove functionally appropriate for other sites. The basic strength of the typology was that it allowed the stratification of our basic unit of analysis: mounded features.

Identification of Structures

The Cerros settlement data, of necessity, have been used to treat that most elusive and recurrent problem in settlement pattern analysis: the identification of a house. Our problem is perhaps more extreme than in other studies because of the absence of dependable ethnohistoric

continuities and poor preservation of the ruins. These factors are a consequence of the amount of time that has elapsed since major construction and occupation occurred at the site. Most settlement studies which have accurately approached the problem of household detection and population density have dealt with Late Classic and Postclassic populations. The Cerros mound population has been beset by the ravages of at least twice that much time. Still, the Cerros data base has been used in an attempt to identify house mounds, given the morphological variability at the site.

House mounds have been defined at Cerros through various independent checks. Size, complexity and abundance have generally been the bases for identification, given the absence of dense domestic trash deposits, as well as such household features as hearths and burials (after Haviland 1970). However, a high percentage of utilitarian and domestic objects have been screen collected from the settlement in association with structures dating to the Tulix and Co'h phases. These artifacts are generally interpreted as indicating the location of a household. In addition, there is some reason to believe that ritual objects are expectably less frequent in house mound locations than on civic monuments. Domestic objects and other small finds from the settlement are currently

under study by James Garber and will be incorporated into his dissertation treating these subjects.

Another means used to assess the function of a mound has been sherd frequencies. Robertson-Freidel (personal communication) has recorded the frequencies of utility ware sherds to slipped ware sherds from most of the test excavations. Initially, it was assumed that utility wares served a domestic function and slipped wares an elite or ritual function. Although there are problems with this approach (Robertson-Freidel 1980), these data have been consulted in assessing the function of structures.

Most small mounds, isolated or in groups of two or three have been defined as house mounds. The majority of these mounds fit in the Type 5 or Type 6 category. These structures are simple in form and comprise 56% of the mounds in the 75 hectares surrounding and including the central precinct. One of the Type 5 mounds was horizontally exposed to test its household function. Structure 34 revealed a small Tulix phase midden deposit off its eastern corner, but no distinctive household features could be identified.

Another kind of house mound is associated with a raised plaza and two or three additional structures. In all cases within the systematically surveyed area, one of the mounds is larger and more prominent than the others.

This arrangement is also evident at Mayapan (Smith 1962: 218) and Tikal (Haviland 1966:31) and may be related to the elevated status of a lineage head and his nuclear family. Presumably, the associated extended family would occupy some of the remaining structures.

The Structure 11 Group represents this type of plazuela association. Although it was exposed horizontally, little midden debris was located. The form of this group is similar to plazuela groups defined as house mounds at Tikal (Haviland 1963). Judging from the elaborate appearance of this structure, it has been designated as an elite dwelling.

Civic architecture is the other class of structure at Cerros. Civic structures are defined as special function buildings which do not incorporate the varied range of domestic activities carried out at house mounds. Ritual paraphernalia is expected to be found in greater frequencies on these structures than on house mounds, and domestic objects are anticipated to be present in lower percentages than at domiciles. Analysis has not proceeded far enough to confirm these test implications. In addition, such tests are clouded by the appearance of elite residence associated with ritual objects.

Civic architecture does reflect a greater variability in form than that indicated by the house mounds. Given the activity specific function of many civic

structures and the number of social and economic tasks performed at an organizational center, greater variability would be anticipated.

This variability in form has become clear through the lateral exposure of three mound groups. These mound groups were initially identified as house mound plazuela groups on the grounds that they morphologically fit into our house mound typology. Elaborateness and size were variables not sufficiently controlled in our initial typology, although the former variable was not really assessable without extensive excavation.

Horizontal exposures were conducted on the Structure 50 Group (a Type 1 mound group) and the Structure 61 Group (a Type 3 mound group). Both were unequivocally identified as ballcourts. The Structure 10 Group is assigned a civic function as a consequence of the paucity of domestic debris and greater abundance of ritual items (Garber personal communication). The mass of this latter group also suggests that this mound group was non-domestic and served a civic function.

Spatial relationships between mounds have been employed in the identification of civic features during the Tulix phase. These relationships will be mentioned in the settlement model, but let it suffice to say that the position of some structures relative to Structure 29 suggests a special civic purpose. In addition, the

location of small structures on <u>Sacbe</u> 2 may suggest a shrine function.

Other civic structures are identified by their imposing size, unusual plan and elaborate masonry and/or facades (the latter seldom preserved *in situ*). The amount of labor required to construct most of the more imposing settlement monuments would have been considerably greater than it would have been for the largest house mounds. More detailed arguments evincing the presence of civic facilities, as opposed to domestic structures, are presented in the excavation data.

The residential and civic structure populations through time are important indices for comparative purposes. In order to extract these data, two units of occupation and construction analysis were designed. Single mound populations were obtained by counting all the mounded features individually. A plazuela group and all mounds in it were assigned a contemporaneous date from a single test unit, unless additional tests indicated otherwise. Although this would appear to be a common practice in the Maya Lowlands (Puleston 1973; Rice and Rice 1980), it may inflate the actual number of mounds constructed or occupied. For this reason an area count assessment has also been calculated. (See Tables IV and V)

The area count simply evaluates discrete occupation loci by weighting an entire plazuela the same as a single mound. This figure is perhaps most meaningful when discussing reoccupation of a mound group, where residence upon each mound is probably unnecessary to create the distribution of ceramics and related litter. In both methods, plaza type features have been included in the total counts. This addition includes plaza Structures 9A, 29A and both <u>sacbeob</u>. These features must be considered major construction expenditures and only directly affect civic construction percentages, though reoccupation of plaza space has been identified and may be associated with ground level residence.

A major problem confronting the Cerros data base is the presence of ground level structures throughout the settlement. Although the issue has been an elusive one, many researchers have seriously examined the problem (Sanders 1960; Haviland 1963; Willey, et al. 1965; Puleston 1973). Puleston (1973:166 and after Haviland 1970) indicates that "hidden" dwellings at Tikal are most evident during the Early Classic Period. At Cerros, however, ground level dwellings are most significant during the Late Preclassic phases, although they may continue through the entire occupation history of the site.

Cliff (n.d.) has demonstrated the presence of ground level structures along the coast line associated

with all phases of the Late Preclassic period at Cerros. Actual human population estimates during the Co'h and Tulix phases for the settlement must be considered conservative until Cliff has analyzed the data. This element cannot be ignored, however, because ground level structures do exist at Cerros and because we have located similar features in the settlement underlying certain mounds and plaza space. Present information does not allow a meaningful estimate for the extent or density of this occupation, but future research is slated to address this concern. At any rate, the structural density figures are comparable to other Maya sites.

Excavated Structures

The excavation program involved a series of test excavations geographically dispersed throughout the 75 hectares immediately surrounding the center. Mound groups were selected for excavation from a stratified judgmental sample. A 20% sample was attempted from each of the formal typological divisions in the mound typology (Table II), although a larger sample percentage was obtained when sample sizes within the typological divisions were small. Specific mound selection was determined by: (1) the biased maintenance of dispersed geographical representation and (2) fortuitous trash exposures revealed by natural agents (windfalls, shoreline erosional profiles, etc.). Elaborate statistical equations were not employed

in our sampling design because of the low probability of statistical meaningfulness, given the size and complexity of the site. Our judgmental sample was developed to take advantage of known and meaningful surface indicators. Selecting our sample in this manner permitted maximum data retrieval for minimum labor cost. Although the sample was not statistically controlled geographically, we attempted to test in every environmental and spatial sector of the community. It is strongly asserted that a more rigid statistical selection would have provided a less useful data set.

The purpose of the test excavation program in the settlement was three-fold. First, it was to establish chronological control. This was accomplished primarily by penetrating and examining the contents of the mound construction fill. A sealed dating context was defined as material capped by an impenetrable layer of plaster flooring or thick melt plaster. Although midden exposure was sought, it was seldom clearly defined. Even though it was often associated with the later Early Classic and Late Postclassic reoccupation of the site, it could not be relied on for determining the major construction date for a structure.

The second intent of the testing program was to expose any architectural features which would aid in describing structures within a refined settlement typology. Exposure of well preserved architecture in the

settlement was also to aid in the definition of those mounded types which were to undergo significant lateral excavation exposure. Unfortunately, the quality and quantity of architecture revealed was not sufficient to modify the typology in itself.

The third focus of the testing program was to determine the function of structures. Although the most difficult objective of the three, it was anticipated that certain kinds of information would be collected from our limited exposures which could be compared to the quality and quantity of information collected from our lateral stripping operations. Midden debris was useful in determining function. A preliminary post holing operation around the flanks of mounds proved ineffective in locating trash at Cerros.

Our initial excavation exposures reflect a period of experimentation in terms of the precise size and location of our test units. However, our experience in the initial testing phase of the settlement has shown that midden debris, architectural detail and construction fill exposure are best identified through the exposure of 2 x 2 meter units located on the flanks of the various structures. To date, extensive lateral exposure has been carried out on four of the six formal structure types in the settlement, with the remaining two types to be horizontally examined during the 1981 field season. Structure

Types 1 and 3 include two Late Preclassic ballcourts and have been discussed elsewhere (Scarborough, et al. n.d.). Structure Types 2 and 5 include house mound loci. Excavation and recovery techniques involved the excavation and screening of naturally defined levels.

Our subdatum for each of the units was the highest corner of the exposure. All test units were oriented to magnetic north unless otherwise indicated. Excavations in the central precinct were generally oriented to true north. All four walls or each excavation unit were profiled, although only two have been redrafted for this presentation. The depth of the various natural lenses is generally not provided due to their undulation through the unit as well as the position of the test units on the sloping margins of the mound. The profiles can be consulted for precise measurements and all significant features are described in the text. The test unit excavations are described from top to bottom in keeping with the frequent sequential references to our lot and level system. Horizontal exposures are described from bottom to top because of the developmental nature of the data and the ease of relating various feature modifications through time.

The Absence of Burials

The presence of non-ceremonial burials in mounded features has been generally argued to be one indicator of

household occupation (Haviland 1970; Thompson 1971). The absence of burials in the settlement at Cerros is quite peculiar when compared to other Maya sites. At Altar de Sacrificios 9 of the 15 Plancha phase burials were taken from the settlement (Smith 1972, Table 5). A total of five burials were recovered from Barton Ramie during the Mount Hope and Floral Park phases (Willey et al. 1965: 531). At Tikal during the combined Chuen and Cauac phases 10 ritually interred burials were apparent in the North Acropolis alone (Coe 1965) and Haviland (1963, 1967) reports at least two in the sustaining area during the Late Preclassic period. The frequencies of Late Preclassic burials in house mounds at other sites are considerably greater than that found in the Cerros settlement. Considering both the extent of our excavation program and the small amount of construction dating to after the Late Preclassic period, it is extremely puzzling that we have not located more Late Preclassic burials. It should be noted that 31 Late Preclassic burials have been excavated from the shoreline setting associated with a dense ground level occupation immediately underlying and east of the central precinct (Cliff n.d.).

The reason for this absence of burials in the settlement may be a consequence of any one of four factors: 1) The site was not occupied long enough for significant numbers of people to have died; 2), the

excavated sample in the settlement has not been extensive enough to define burials; 3), the settlement population at Cerros was interring their dead in the dense ground level occupation located near the central precinct; or 4), the high seasonal water table and the stone construction fill of the mounds at Cerros have promoted a condition of rapid decomposition for bone and other organic substances.

The first explanation has been disconfirmed by the ceramic analysis undertaken by Robertson-Freidel (1980) and the radiocarbon dates. Robertson-Freidel indicates that the Co'h/Tulix phase interval lasted for 350 years. The second explanation can be dismissed because well over 1000 square meters of excavation area has been penetrated in the settlement. It is unlikely that sampling error is a major problem.

The third explanation cannot be readily dismissed and may in part explain the number of burials recorded from this restricted area. The fourth explanation, however, is suggested to be responsible for the absence of many burials. A Postclassic cache accompanied by an infant burial on Structure 4A indicated a rapid decomposition of the bone when placed in limestone rubble construction fill. Only the crowns of this child's unerupted molars bear witness to this burial. Although the unerupted teeth may have been deliberately smashed away

from the jaw for inclusion in the cache, it is more likely that the entire skull was offered. If this sort of decomposition has taken place in the last 500 years then the last 2000 years would have left next to nothing.

The presence of the 31 burials may be attributable to the manner and location in which these burials were interred. The dense burial concentration on the shoreline is sealed by a two to three meter thick plaza deposit overlying the fine silts and clays defining the burial matrix. These burials are less subject to water percolation due to the fine soil fraction around them which reduces erosion. This condition is generally not the case in the settlement. Nearly all Tulix phase mounds are composed of unsealed limestone rubble fill which promotes water percolation and the condition described on Structure 4A. In addition, at those sites where Late Preclassic burial populations are preserved in house mounds, the mound fill is generally earth fill (Altar de Sacrificios, Barton Ramie, Cuello and Tikal). Earth fill is the major component for most building operations in northern Belize (Hammond 1973, 1975).

Structure 10 Group

Group 10, composed of Structures 10B, 10C and 10D, represents the largest mound cluster in the settlement. This Type 2 structure group rests on the southern flank of the low lying plaza Structure 9A south of

Structure 9 within a huamil setting. It is located near the northern terminus of the western sacbe (Feature 126) with both its southern and western margins near the depressed zacatal setting. The mound group appears to be oriented towards the central precinct in a manner not unlike Structures 13, 14, 15 and 16; all structures in the immediate vicinity of the Structure 10 Group. Although the structure has been assigned a tentative Late Preclassic/Early Classic period date, the underlying sub-plaza Structure 9A was constructed during Tulix times. The imposing size and complexity of this structure group suggests that it served a non-residential function. Given the general paucity of Classic architecture at the site, it is believed that the Structure 10 Group was one of the major foci of Classic period activity following the reoccupation of the center. In addition, some Postclassic occupation is indicated in our surface collection. (See Fig. 14.)

Structure 10B (Operations 12 and 110)

This structure is the largest and southeastern-most mound in the group. It is 45 m. long, 27 m. wide and 5 m. high. It has a potential summit floor space of 270 m^2 and an absolute volume of 3713 m^3. In addition, an apparent chultun was located 10 m. south of Structure 10B and outside the plazuela group. It seems

to have been cut into the limestone bedrock with only a small constricted orifice visible from the surface.

A 6.75 m. by 1.5 m. trench (OP12) was put into the southwestern edge of the mound in hopes of uncovering trash deposits and/or a retaining wall during the 1974 field season. Unfortunately, neither a retaining wall or plaster melt were encountered. Mound layering, however, was evident with the bulk of the mound consisting of dry rubble fill underlain by a lens of larger rubble within a light grey loam. If a retaining wall existed, it was composed of uncut rubble that has long since been destroyed. The small artifact inventory contained a mixture of Late Preclassic and Late Postclassic material.

Operation 110, a 16 m^2 exposure, was opened at the summit of Structure 10B during the 1977 field season. These excavations were conducted along the medial axis of the mound immediately above what appeared to be an out-cropping stairway section. Anticipating a range structure, given the size and elongated shape of the mound and its similarity to Structure 11B (another Type 2 plazuela group structure discussed below), we predicted the presence of masonry walls and plaster floors. This prediction was plainly disconfirmed. Instead, we defined a 30 cm. thick lens of hearting gravel underlain by boulder size fill stones. Although Late Preclassic ceramic diagnostics

were identified, the most recent debris from within the unsealed hearting was Classic utility ware.

Structure 10C (Operation 109)

Structure 10C is one of two conical mounds approximately 22 m. north of Structure 10B. It is 28 m. long, 25 m. wide and 5 m. high. It has a potential summit floor space of 80 m^2 and an absolute mound volume of 1950 m^3.

Operation 109 was excavated during the 1977 field season in anticipation of architectural features and trash concentrations. Part of this operation consisted of a 2 x 10 m. proximation trench excavated to a depth of 1.4 m. that extended from the plaza up to the edge of a crude platform. Unfortunately, this sub-operation provided only minimal information. The absence of any indications of a masonry stairway on the medial axis of the mound, however, suggests that there never was one.

A more productive sub-operation in which 43 m^2 were excavated to a depth of 1.7 m. was conducted on the summit of the mound. Artifactual debris was recovered in low frequencies and no primary features were located. However, one concentration of utility ware ceramics of Classic period date was recovered approximately 20 cm. above the remains of the platform.

The platform appears to be D-shaped in plan with its straight face oriented into the plaza. The front

exposure is four courses high and composed of crude undressed stones set in a marl grout. The backside of the platform is defined by a poorly preserved curvilinear, single course alignment. The platform appears to have projected above the frontal slope of the mound. Willey, et al. (1965:97) indicate a similar condition at BR123 period 3. The tendency of the Maya, during all periods, to level previous mound occupations to make way for subsequent structures may suggest that another occupation, as yet unrevealed, underlies this platform. The apparent use of only a portion of the total mound surface area available to the platform builders might suggest this to be the case.

Five ill-defined "clean" marl lenses within one meter of vertical exposure, sandwiched between layers of rubble fill, indicate that the interior of the structure was artificially raised above the lower retaining wall, probably in the Classic period. It should be noted that the nearly clean white marl and rubble fill of Structure 10C contrasts sharply with the trash laden fill of Structure 10B (below) as well as with the tan topsoil overlying the rubble core of Structure 10B. This difference relates Structure 10C to the conventions of construction found in the monumental public architecture of the central precinct where clean fill is strongly preferred (Garber personal communication). Although it is difficult

to estimate the floor space provided by the platform, the exposed western side of the retaining wall enclosed an area of 12 m^2. Symmetry would suggest a similar platform wing area to the east in an area which has yet to be excavated.

The age of the above platform is puzzling. A Preclassic date has been tentatively assigned due to general morphological similarities with those of Structure 11B. Additional support is suggested by the one meter of overburden capping the site which is thought to be Classic mantling. It is of interest to note that no clear weathering horizon was discernable which may suggest a continuity of occupation at this locus following the general abandonment of the center proper.

Our inability to obtain a firm date for this platform necessitated a revision in our sampling technique. Limited post holing on the back and lateral sides of this and other poorly dated mounds was carried out in an attempt to locate associated midden deposits (after Fry 1969). However, the limited number of sherds collected from the preliminary post holing program, even after controlled test pitting operations, forced us to return to sealed construction fill contextual dating. (See Rice and Rice 1980:438 for brief discussion of these techniques.)

Structure 11 Group

Group 11 is composed of three structures on a raised plaza labelled Structures 11B, 11C and 11D. This Type 2 structure group rests within a huamil setting flanked on three sides by depressed zacatal and thornscrub savanna. The present shoreline is less than 40 m. to the northwest. The largest mound, Structure 11B, is oriented to the west and the two other structures appear to be directed towards this better preserved structure. The structure group has been assigned to the Tulix phase although an Early Classic period modification of the structure is suggested. A Late Postclassic period reoccupation is also apparent. This structure group is thought to represent a residential function. In addition to Postclassic grinding stones and net weights (after Eaton 1976, 1978; Phillips 1980), more than a dozen Preclassic ceramic net weights were recovered (Garber personal communication). (See Fig. 15.)

Structure 11A (Operation 102)

Structure 11A is the raised plaza area supporting the three associated substructures. Operation 102 was excavated during the 1976 season in order to obtain midden debris while documenting the constructional history of the plazuela group. The 1 x 5 m. trench was located on the backside of Structure 11D. Assuming the prevailing winds had not changed over time, the location of the

trench downwind and behind the plaza area was thought to be ideal for trash deposition. Unfortunately, true primary deposition trash was not located.

The trench was also extended into the raised plaza area. The data indicate that the plaza may have been paved in the Late Preclassic period with a dark soil matrix. An overlying Late Postclassic period humus was underlain by this Late Preclassic pavement which was in turn supported by a loosely packed limestone rubble core. The plaza construction fill appeared to be less tightly packed than that of the mounds themselves.

Structure 11B (Operation 103)

Structure 11B is approximately two meters higher and east of the adjacent mounds in the Structure 11 Group. It is 25 m. long, 20 m. wide and 3.5 m. high. It has a potential floor space of 130 m^2 and an absolute volume of 1103 m^3. The plan of Structure 11B is not unlike a scaled down version of Structures 29, 30 and 31 at the North Acropolis of Tikal (Coe 1967) each oriented to the west and perhaps dating to the Early Classic period in their final form. (See Fig. 16.)

During the 1974 field season a 1 x 3 m. unit was excavated to a depth of 2.15 m. at the summit of the mound. This exposure provided a degree of stratigraphic control for subsequent work on the mound. During 1977 the mound was excavated horizontally in an attempt to

expose architectural and artifactual associations. More than 125 m^2 or nearly all of the northwestern half of the platform was exposed and mapped to a maximum depth of 2.3 m. A 2 x 2 m. arbitrary grid control was maintained during the course of excavations to insure accurate horizontal as well as vertical provenience for anticipated activity area relationships.

The earliest construction activity is represented by a friable lens of reddish brown clay underlain by trash, soil and gravel ballast. This event appears to represent the leveling of an earlier occupation in preparation for the next constructional episode. Because this lens is at the same elevation both inside and outside the overlying building, it is suggested that the entire mound surface was prepared by the builders responsible for the subsequent building. Ceramic diagnostics from the trash deposit underlying the lens date to the Late Preclassic period.

The elaborate building platform overlying this leveling event is Preclassic in date as well, although no primary caches or burials were found. The building platform was composite in plan. A large rectangular west room fronting the plaza was connected to an eastern rear room by a constricted accessway. The masonry is more substantial than many other architectural contexts in the settlement zone. The chinked walls are composed

of rectangular stones that were covered at one time by a thick coat of red and white plaster. The backside of the platform may have been curvilinear in plan, possibly indicating a building convention similar to that revealed in Structure 10C. Unfortunately, the rear portion of the platform was badly deteriorated, preventing the testing of this hypothesis. Near the northwestern corner of the platform, a recessed wall niche (1 x 1 m.) was exposed. It appears to have been adorned by a relief panel of plaster, molded on carved stone and painted red, buff, black and white. Architecturally, this polychrome molded stucco facade was probably supported by four tenoned and grooved stones projecting from an upper course in the niche which has since collapsed. Excavation of the niche also produced an interior south wall behind the wall supporting the relief, indicating that the building platform was originally constricted 80 cm. more. It should be noted that fragments of a smashed jade bead and a portion of a jade ear flare found in the niche may indicate an elite termination ritual associated with the abandonment of the mound during the last hours of the Late Preclassic period at Cerros.

Although the front of the building platform was only surficially examined, a stairway probably ascended from the plaza to the building. A plaster floor extended over the building platform on the front, or plaza, side

of the niche creating an enclosed rectangular space separated from the main building and stairway by wall stub alignments. Three plaster floors were accounted for on this veranda-like frontal room, one immediately overlying another. The main, or rear, superstructural room was not as well preserved, but two temporally separated plaster floors were discernable. The stones defining the front and side walls of the main room appear to be well dressed loaf-shaped blocks similar to those found in the central precinct and dating to the Late Preclassic period. Although the rear wall was not discovered, the main room must have been over four meters wide by six meters in length. In addition, the veranda-like frontal room was three meters wide by at least eight meters in length. The southern third of the mound was not excavated preventing the recording of exact dimensions for these rooms.

Associated evidence indicates that the two rooms were originally at the same elevation. They were defined by stone foundation walls with perishable upper walls. No post holes, post molds or post impressed briquettes were recovered. The rooms were connected by two or more entrance ways. At a later time, the main eastern room was raised and the doorways were modified with the addition of steps. The Preclassic date accepted for these events was derived from diagnostic ceramics taken from sealed floors in the front and back rooms, from sealed

wall fill representing sequential modifications of the building plan and from construction fill incorporated into the building platform.

An Early Classic occupation of the mound is suggested by the appearance of Tzakol basal flange bowl fragments in extremely low frequencies. These five sherds would appear to suggest the presence of a rather ephemeral reuse of the site by an Early Classic group, not unlike that found in other contexts within the central precinct. The proximity of Classic materials to the final Preclassic construction phase, coupled with the absence of any subsequent construction dateable to the Classic period suggests that the building platform was still largely visible and reused by Classic period occupants.

The most recent pre-Columbian occupants of this site appear to have been Late Postclassic groups, represented by a poorly defined rectilinear wall stub and patches of poorly preserved plaster flooring. This structure and hypothesized perishable room extensions may have covered most of the level mound surface. The occupants appear to have constructed their foundation on top of the earlier Preclassic wall stub foundation. The floor within the wall alignment seems to have been underlain by large flat-laid limestone ballast. This type of flooring may be similar to Wauchope's description of

"embutido," in which large flat stones were irregularly placed in a matrix of lime and marl (1938:15). A threshold area was located along the medial axis of the structure. A small dedicatory cache of Postclassic affinity was discovered immediately outside the structural wall alignment to the west.

A trash deposit on the southeastern slope of the mound contained a high frequency of lithic debris. A concentration of Postclassic sherds, apparently from a single pot, were found strewn over the northwestern wall foundation suggesting post-occupational reuse. A chlorite schist ax was also collected from this context.

The dry-laid rubble defining the northeastern portion of the mound suggests that the Postclassic occupants may have purposely buried the underlying retaining wall or platform. (For an analogous situation, see Willey, et al. 1965:69; Bullard 1973:236.) The wall alignment overlying this disturbance indicates that between the Late Preclassic/Early Classic and Postclassic periods, a large portion of the Preclassic component was destroyed and subsequently overlain by a large amount of rubble fill.

Even though Structure 11B lacks diagnostic household features (Haviland 1970), its form and size coupled with its relationship to the ancillary plazuela Structure 11C and Structure 11D indicate affinities to

other domestic structures in the Maya area. The elaborate nature of Preclassic period architecture at Structure 11B suggests a strong social linkage to the central precinct approximately 460 m. to the northeast. Although the differential consumption of luxury ceramics and lithics and exotic materials must await analysis, the evidence at hand suggests that elite residence would have been in the settlement zone.

Structure 11C (Operation 108)

Structure 11C lies approximately 15 m. northwest of Structure 11B. It is 25 m. long, 22 m. wide and 1.5 m. high. It has a potential floor space of 192 m^2 and an absolute volume of 557 m^3.

During the 1977 season a 24 m^2 exposure was excavated to a depth of 1.2 m. Instead of employing a proximation trench, a contiguous horizontal exposure was opened at the summit of the mound. The low, flat appearance of Structure 11C and the absence of raised masonry retaining walls associated with other small mounds in the settlement made this type of excavation preferable. Although smaller in size than the other structures, Structure 11C was excavated in an attempt to elucidate variability within the plazuela group.

The building platform was composed of light grey marl intruded by cobble size and larger stones. The excavation produced a sizeable sample of Postclassic

lithic debris (after Rovner 1975) as well as Late Preclassic and Late Postclassic ceramic diagnostics. Unfortunately, architectural features were not defined for any period. No ceramics were found in primary deposits, although a Late Preclassic component appears to have been encountered approximately 50 cm. below the surface.

Structure 11D (Operation 16)

Structure 11D is located approximately 15 m. southwest of Structure 11B. It is 20 m. long, 15 m. wide and 1.5 m. high. It has a potential floor space of 140 m^2 and an absolute volume of 330 m^3. During the 1974 field season a 2 x 2 m. test unit was excavated to a depth of 2 m. at the summit of the mound. A stratigraphic column was anticipated.

The mound was constructed of dry-laid rubble overlying a deposit of dark brown clay (5-10 cm. thick) containing a Late Preclassic sherd inventory at 1.4 m. below the summit of the structure. The depth of this lens corresponds to the same absolute elevation at which trash and dark soil were recovered from Structure 11B. This suggests an extensive though poorly preserved component occupied or simply deposited before the plazuela mounding occurred. This event corresponds to the earliest leveling operations described in Structure 11B. A thin marl lens underlies this deposit and appears to be a preparatory surface overlying the sterile paleosol.

Structure 9

Structure 9 is a large range-like structure resting on an extensive split level plaza area. Structure 9B is a Type 4 structure located in this *huamil* setting. It is oriented towards the central precinct, lying 180 m. south of Structure 6B. The paved plaza Structure 9A extends north to the foot of plaza Structure 7A and as far south as the Structure 10 Group. The more elevated northern half of the plaza is further defined by the present shoreline and the western margin of plaza Structure 8A. The southwestern limits of the plaza are less distinct, although the western shoreline is again suggested (a portion of it may have been removed recently for rock fill). Its southeastern edge is defined by Structures 13, 14 and 15 which rest upon it. Plaza Structure 9A covers approximately 26,400 m^2.

Structures 9A and 9B have been assigned a Late Preclassic period date, although an ephemeral Late Postclassic occupation is indicated. Structure 9B is understood to have served a non-residential function. Its imposing size and proximity to the center proper suggests strong affinities to the largest monuments at the site. (See Fig. 17.)

Structure 9A/Feature 33A Operation 107)

Feature 33A represents a flat test excavation approximately 90 m. southwest of the medial summit of

Structure 9B. An uprooted coconut tree revealed the location of this feature within plaza Structure 9A. Operation 107 was excavated during the 1976 field season in anticipation of midden debris. A 2 x 4 m. unit was exposed to a maximum depth of 1.0 m. The long axis of the unit was oriented to magnetic north. (See Fig. 18.)

Six naturally defined and two arbitrarily defined levels were divided into nine lots. The surface level consisted of a loose, grey humus loam intruded by boulder size rubble fill. This 40 cm. thick surface rubble deposit represents plaza Structure 9A and is understood to be Tulix phase. No flooring was apparent due to the exposed nature of the plaza.

Levels three and four were arbitrary lots consisting of a loose, moist, dry grey clay intruded by angular limestone gravel underlying the plaza. This deposit was excavated in 10 cm. vertical units due to the abundance of midden debris collected. Sherds, charcoal, ash, bone and shell were present in high frequencies. A high percentage of ceramic diagnostics, together with thermoluminescence dating (Belew 1978), indicate that the midden was probably deposited as the plaza was extended a short time after the midden defined in Operation 1. This trash has been assigned a firm Co'h phase date.

Level five consisted of a compact, moist 5-10 cm. thick sascab floor mottled by the overlying grey clay

trash deposit. Predictably, the trash inventory decreased substantially on this house floor. Level six was defined as a compact, moist, well sorted beige clay underlying the floor. It was intruded by a discontinuous band of severely eroded pebble to cobble size hearting stones. A post hole was located in the southeastern portion of the unit apparently associated with the sascab floor. In section, it was found to be 14 cm. in diameter and to extend approximately 20 cm. below the sascab floor surface. The sascab floor appeared to feather out on two of the four sides of the unit. Although the perimeter of the structure could not be traced, evidence suggests that our test unit may have straddled the edge of the structure. Artifact densities inside and outside the structure were not revealing.

Level seven consisted of a compact, moist, well sorted blue clay gumbo. The water table was contacted at 80 cm. BSD. This matrix contained a few unidentifiable sherds and is suggested to be a riverine clay deposit associated with the earliest occupation at the site. Level eight was the decomposing yellow granular caprock deposit. Chemical and physical soil analysis has been carried out on levels six, seven and eight.

Feature 33 has produced a significant information base. The underlying Co'h phase midden deposit and ground level structure as well as the underlying clays

further support the hypothesis that Cerros developed geographically from an Ixtabai/Co'h phase village adapted to a riverine economy. The presence of the Tulix phase plaza Structure 9A corresponds with a major sociopolitical adjustment at Cerros. By the Tulix phase the intrasite area as defined by the canal has taken on a civic community character unlike earlier occupations.

Structure 9B (Operations 10 and 13)

This structure is 70 m. long, 24 m. wide and 3.5 m. high. It has a potential floor space of 480 m^2 and an absolute volume of 3948 m^3. A medial outset staircase appears on the north side of the structure.

Operation 10 was excavated during the 1974 field season. A test pit was placed near the center of the mound between two slightly elevated superstructural platforms at either end of the east/west oriented mound. This four square meter exposure was excavated to a depth of 2.3 m. in an attempt to date the mound by means of a primary associated cache. Although no dedicatory offerings were located, a stratigraphic sequence was discernable.

A scattered Postclassic component was located within the humus horizon and underlain by white marl and rubble fill. A brown sandy matrix was encountered approximately 90 cm. BSD (below standard datum). Rubble fill severely intrude this matrix. Three additional marl

lenses, also intruded by rubble fill, were noted before terminating the exposure. The marl concentrations were extremely ephemeral and mixed with a sandy matrix making them difficult to isolate. This suggests that the fill for the mound was thrown together rather than deposited in clean fine lenses.

At approximately 1.05 m. BSD one of the marl layers was found to be better defined, being continuous across the horizontal exposure. It was 2 cm. thick and contained burned limestone chunks. Little in the way of artifactual diagnostics were recovered. This lens lay at approximately the same depth as the marl lens reported in Operation 101 (Structure 9C). Unfortunately, we cannot yet confirm this lens as being so continuous.

An abrupt increase in sherd fill was noted at 1.5-1.9 m. BSD. This appears to be a Late Preclassic component, but the limited exposure did not allow primary contextual control for a firm date.

Operation 13 was excavated during the 1974 field season. It was a trenching operation located on the northwestern slope of the mound. The 2 m. wide by 9 m. long exposure was excavated parallel to the long axis of the mound on its upper slope. An additional 1.35 m. by 1.5 m. exposure extended below and perpendicular to this trench. This T-trench was excavated in anticipation of

architectural features and the surface suggested trash deposits.

Upon removing the fill overlying the structure, a crude upper riser was exposed. It was defined by five uncut limestone slabs placed vertically as a retaining wall for the cobble size rubble and marl fill composing the mound. The sherd inventory overlying this feature contained a high percentage of Postclassic censer ware as well as chert flakes and a low frequency of obsidian blade fragments. Fish and sea turtle bone in addition to numerous ceramic fish net weights (see Eaton 1976, 1978) were also found in this context.

The T-trench further exposed a Late Preclassic cut stone wall 1.7 m. BSD behind and underlying the apparent Postclassic riser. The cut stone wall consisted of a four to five course chinked wall exposure with a basal molding. Each cobble size stone was rectilinear in form. Bits of plaster and sascab suggest that the surface was covered to prevent the exposure of the irregular arrangement of stone coursing. The height of the wall was 80 cm. at its best preserved location. The basal molding consisted of horizontally bedded cut stones extending out from the wall. The lateral extent of the molding and the underlying floor could not be determined.

The sherd inventory collected behind and under these features date to the Late Preclassic period exclusively.

Structure 9C (Operation 101)

Structure 9C is a slight superstructural feature at the top eastern side of Structure 9B. The superstructure is poorly defined by a rectilinear single course arrangement of limestone blocks approximately 2 m. east/west by 4 m. north/south. It appears to be associated with a Late Postclassic occupation of the site.

Operation 101 was excavated during the 1975 field season. It was a restricted 1 m. by 2 m. exposure excavated in an attempt to date the feature. A marl matrix intruded with large limestone blocks was located upon penetration of the mound. It is in turn underlain by large dry-laid rubble fill. The marl disposition may be an occupational event, but little associated debris was collected. Some evidence of construction pauses within the fill of the mound is suggested by the appearance of a sandy soil sandwiched between the rubble fill at 1.5 m. BSD.

Structure 34

This Type 5 structure rests in a well drained huamil setting. It rests in the scoured and pitted caprock relief associated with the northeastern intrasite area. The southern margin of the mound is flanked by an

apparent run-off channel issuing into the main canal. This structure is oriented N45°W of magnetic north and would appear to be directed towards the central precinct. The structure has been assigned an early Tulix phase date, though major Protoclassic modification of the structure is evident. The construction appears to have been initiated during the Tulix phase, but significant modifications occurred during the Protoclassic period. The mound locus was also the seat of a stratigraphically earlier Tulix phase activity, though no structural remains are apparent. An Early Classic reuse of the structure is apparent. Postclassic debris was collected on the surface. The structure is viewed as a Tulix phase/Protoclassic domestic facility. Ground stone, ceramic net weights and sherd lid covers suggest Tulix phase domestic occupation. (See Figs. 19 and 21.)

Structure 34A (Operation 118)

This structure is 16 m. long, 14 m. wide and 1.0 m. high. It has a potential summit floor space of 36 m^2 and an absolute volume of 130 m^3. During the 1978 field season a 2 x 2 m. unit was placed on the northern flank of the structure. It was excavated to a maximum depth of 1.4 m. Upon exposure of two retaining wall features and an exterior plaster floor, Structure 34 was selected for further lateral exposure during the 1978 field season. The horizontal exposure revealed 53 m^2 on

the northern half of the structure to a maximum depth of 1.7 m. A 2 x 2 m. arbitrary grid control was maintained to insure accurate horizontal as well as vertical provenience for the anticipated activity area relationships. These data were to be compared and contrasted with Structure 11B and other less extensive excavation areas. (See Fig. 20.)

The earliest component suggested at this site locus is a Tulix phase ground level occupation. Architecturally it is not well documented, though ceramically the inventory included large sherds and other trash debris in and overlying the sterile black gumbo paleosol. A discontinuous 5-10 cm. thick lens of gravel size hearting stone capped the paleosol and probably represents the remains of the original flooring of the structure. The overlying small boulder size rubble coring together with the thick concentration of sascab melt may represent the razed remains of this dwelling.

The next component has been defined as a simple rectangular Tulix phase platform. It was approximately 6.95 m. long by 5.70 m. wide and attained a maximum preserved height of 90 cm. (6-8 courses in elevation). The chinked retaining wall was composed of rectangular stones set in a thick marl grout. The construction fill consisted of a dry-laid small boulder size rubble overlain by a cobble size ballast encased in an intruding humus

fill. No interior flooring was associated with the platform, it apparently having been stripped away during the subsequent modification of the mound. An exterior hard plaster floor was associated with this construction event. The structure was oriented N45°W toward the center proper.

The major construction phase has been identified as a two step Protoclassic platform with an outset staircase or ramp. It was approximately 7.75 m. long, 6.60 m. wide and attained a maximum height of 90 cm. The outset was 3.75 m. long and 3.20 m. wide. The treads and risers were severely damaged. The structure incorporated the Tulix phase platform by adding an additional retaining wall to the entire structure. This outer wall was placed 30-50 cm. from the inner wall, running parallel to its N45°W orientation. It was constructed with the same rectangular stones set in a marl grout as identified for the inner wall. The fill between the two walls consisted of cobble size coring packed in a white marl matrix. The outer wall was one to two courses lower than the inner wall providing the stepped appearance to the structure. No interior platform space flooring was preserved. An exterior plaster floor was found preserved within the inset corner areas of the outset staircase as well as at the eastern corner of the structure. Traces of flooring were also noted along the northeastern side of the

structure suggesting that the area immediately outside the structure generally had been plastered. Hearting stones 5-7 cm. thick were found to underlie the better preserved portions of this floor.

The outset staircase was hung on the northwest side of the outer platform wall. It was composed of the same rectangular stone masonry as found in the other two walls. At the juncture of the outer platform wall and the outset, the staircase attained a height of six courses (60 cm.). The fill within the outset was the same cobble size ballast as found between the platform walls but contained a large percentage of sascab/plaster melt.

A substantially Early Classic reuse of the structure was evidenced by a continuous clean marl cap or lens (5-10 cm. thick) covering most of the platform. One possible post hole, similar to those defined on Structure 50D (see Scarborough, et al. n.d.) was located between the two platform walls and approximately 1.0 m. northeast of the southwest inset. It was 10 cm. in diameter. Along the medial axis of the mound and 50 cm. southeast of the inner wall was located a Tzakol basal flange bowl at a shallow depth. It was badly disarticulated and appears not to have contained any additional offering.

Structure 34 is believed to have been a residential facility. Its orientation and location within the

intrasite area suggest that it may have been an elite residence during Tulix and Protoclassic times.

Structure 76 Group

This structure group represents the focus for a complex of eight separate mounds within 100 meters of Aguada 1 (Feature 79). Structure 76 can be classified as a Type 2 mound group, although its form and orientation are unlike that defined elsewhere in the settlement. It lies within the monte alto setting. A late Co'h or early Tulix construction phase date has been assigned, although the ephemeral Classic and Postclassic occupation have been noted. Aguada 1 is argued to be a Co'h phase man-made reservoir formed as a consequence of the fill necessary in constructing Structure 76. The clustering of the mounds around Structure 76 as well as their proximity to Aguada 1 may suggest a degree of water management at the southern margin of the hulub bajo setting.

Although our sample of the Structure 76 is very small, the absence of household midden debris would be expected given a non-residential function for this group. Surely the size and relative dominance of this structure compared to the adjacent structures would argue for a different function. (See Fig. 22.)

Structure 76B (Operation 112)

Structure 76B is 34 m. long, 33 m. wide and 4 m. high. It has a potential floor space of 320 m^2 and an absolute volume of 2884 m^3. This site was selected for excavation because of its imposing size and its distance from the main central precinct.

During the 1978 field season a 2 x 4 m. trench was positioned on the sloping western margin of this acropolis-like platform (Structure 76B) which rests on an elevated substructure (Structure 76A). The excavation is believed to have intersected the medial axis of the structure. The long axis of the unit was oriented N10°W. The trench was excavated to a maximum depth of 2.4 m., although the southern half of the unit was terminated at a depth of 1.15 m. (See Fig. 23.)

Although the unit was lotted into three natural excavation levels, no floors or architecture were revealed; they apparently weathered away long ago. The upper stratum was defined by a friable dark grey clay loam intruded by numerous limestone gravels. This matrix graded into gravel size ballast packed in a friable light grey marl. The thickness of the ballast varied throughout the exposure with the northern third attaining a depth of 2.0 m. BSD, although the lower 1.3 m. of fill was essentially dry-laid. The southern and eastern portions of the unit changed to cobble size and larger dry-laid

rubble fill within 30 cm. of the surface. The remainder of the unit below 2.0 m. was also dry-laid cobble size and larger rubble coring.

Our excavations may suggest that the northern and western portions of the unit supported a ramp or stairway connecting Structure 76D (to the northwest) with the raised substructure (Structure 76A) given the thickness of the hearting within the trench. Although no evidence for plaster surfacing was recovered, a thick, dense ballast would be expected in this location. The large rubble fill near the surface in the southern portion of the unit may indicate that less traffic was directed across this surface. Although erosional agents may account for some of the missing hearting, the slope angle of this location is not critical and would not seem to be greatly affected by wasting. The profiles further suggest that the acropolis, or Structure 76B, was not a later addition to the structure but was moulded into the initial form of the structure.

Structure 76D (Operation 113)

Structure 76D is 20 m. long, 12 m. wide and 1.8 m. high. It has a potential floor space of 64 m^2 and an absolute volume of 274 m^3. This structure lies to the immediate northwest of Structure 76B.

Although our summit trench provided an unmixed late Co'h phase date for the structure group, the sherd

sample collected was from an unsealed context. During 1977, we located a 2 x 5 m. trench between the northwest margin of Structure 76A and the southeast edge of Structure 76D, in anticipation of sealed construction fill as well as architectural detail. The long axis of the unit was oriented to magnetic north. The trench was excavated to a maximum depth of 2.0 m. This location was selected because slope wash and wasting from above had apparently settled in the trough between the two structures quite early on. This overburden was believed to have lessened the surface deterioration of the original structure unlike the unprotected summit exposure. In addition, a portion of the hypothesized ramp or stairway between the two structures suggested by our summit trench was anticipated at this location. (See Fig. 24.)

Eight lots and four natural levels were excavated. The surface stratum consisted of a dark brown humic clay intruded by roots and fall stones. This was underlain by a poorly developed B-horizon of dark friable clay intruded by gravel size and larger limestone. The northern third of the unit was underlain by gravel size ballast thought to be a Postclassic and Early Classic reoccupation mantle.

The second natural level consisted of dark friable clay intruded by gravel to small boulder size limestone. A hard plaster floor was defined 1.2 m. BSD. Plaster chunks associated with a clean white marl were found

throughout the matrix. Although this stratum represents fill and fall associated with the final occupation of the mound, some of the debris resting on the floor is probably associated with the original construction and initial occupation of the structure.

The hard plaster floor associated with the base of this level did not continue into the southern third of the trench, although the same level was arbitrarily defined through excavation. The fill in the southeast portion of the unit was a very friable marl matrix intruded by few gravels. To the north this matrix graded to a grey clay marl intruded by numerous gravels. Pockets of marl and plaster melt appeared throughout. The presence of the thick marly matrix corresponds to a diagonal break in the hard plaster floor. Even though preservation was very poor, it may be that this latter deposit in some way reflects the approximate position of a connecting ramp.

The third natural level was defined as the matrix below and including the 5-7 cm. thick hard plaster floor. Sixty to seventy cm. of dry-laid hearting gravel was underlain by a continuous single layer of dry-laid limestone boulder rubble. In the southeastern portion of the unit, gravel to cobble size limestone packed in a friable

light grey clay were found to underlie the floor as it feathered out.

A poorly preserved four course high retaining wall (Wall 1) was contacted in cross-section in a southern excavation wall. To the southwest, a thick, dense deposit of sascab melt containing sizeable chunks of plaster was isolated in front (west) of this retaining wall. A second crudely faced retaining wall (Wall 2), three courses high, located in the western profile defined the northern most extent of the plaster melt. The two retaining walls are interpreted to have joined in forming an inset corner between Structures 76A and 76D. The plaster melt outside the poorly preserved walls is argued to represent the razing of a superstructure or facade from the summit of Structure 76D. The hard plaster floor appears to have formerly overlain and defined the edge of the retaining walls.

Level 4 consisted of a 2 cm. thick white marl lens underlying the rubble core of the construction and overlying a dark brown paleosol. To the north the white marl was replaced by a dark friable clay loam intruded by the rubble. Both Structures 76A and 76D are believed to have been underlain by this white marl preparatory building surface.

Structure 84

This structure represents one of eight isolated structures surrounding the Structure 76 Group. It was selected for excavation because of its diminutive size in relation to Structure 76 Group and because of a greater sherd scatter on the surface than reported from the other small Type 5 and 6 mounds in the vicinity. The mound rests in proximity to a huanal setting, although monte alto defines the immediate surrounding. The structure has been assigned an Early Classic period date, although Postclassic reoccupation is suggested. It has been tentatively identified as a house locus. (See Fig. 22.)

Structure 84A (Operation 143)

This Type 5 structure is 15 m. long, 12 m. wide and 50 cm. high. It has a potential summit floor space of 18 m^2 and an absolute volume of 50 m^3.

During the 1977 season a 2 x 2 m. test unit was located near the southeastern margin of the mound. The location was selected to contact a possible retaining wall or associated floor as well as expose potential midden debris. Neither of these objectives were realized, but enough pottery was collected from the construction fill to provide for an Early Classic date. (See Fig. 25.)

The strata were lotted into two natural levels. Both levels were poorly defined and seriously disturbed by root action and leaching. The surface stratum

consisted of a dark clay loam A-horizon intruded by small boulder size fall and gravel fill ballast. The lower stratum graded into a light brown loamy clay intruded by dense concentrations of gravel size ballast. The base of the structure was defined by crude tabular limestone boulders within and overlying a thin viscous brown paleosol. Surface undulating, sterile, heavy calcareous clay underlay the exposure. The water table was defined at the base of the exposure. No marl preparatory surface was associated with this Early Classic construction.

Although few of our expectations were met in the examination of this mound, an apparent cultural selection for a rather depressed setting was evident. Given that the mound functioned as a house mound, it would appear that the depressed and undulating paleosol was stabilized by laying down foundation stones to prevent mound settling.

Feature 126

The Sacbe 1 or raised causeway Feature 126 connects the ballcourt Structure 50 Group with the plaza area on which Structures 10, 13, 14 and 15 rest. It traverses the most depressed zacatal setting in the settlement, being well defined across 210 m. of clay gumbo or yax'om soil. In plan, the sacbe is not altogether straight but reflects a slight bow or curve. The actual orientation of the feature is approximately N46°W. It rises above the flanking bajo by a meter or more, although the

immediate margin of the sacbe extends less than half a meter above the silting zacatal setting. The width of the feature was approximately 6.0 m. as evidenced in our cross-section, but the margins of the sacbe may have slumped away. In addition to the communication exchange made available, the sacbe may have functioned as a dike preventing the flow of water out of the eastern half of the zacatal area. We have assigned an early Tulix phase date to the sacbe, even though the sherd inventory was very meager. Our Tulix phase date on Structure 50 Group as well as the contemporaneous date assigned to Structures 13-16 further support the Late Preclassic construction date.

Feature 126A (Operation 115)

A 1 x 8 m. trench was positioned within the northern third of the feature. The specific location for excavation was selected because of the well defined margins of the sacbe at this location. The unit was oriented perpendicular to the long axis of the sacbe. (See Fig. 26.)

The strata were lotted into two natural levels. The surface level was defined by a 10-20 cm. thick lens of black viscous clay or gumbo analogous to that defined in adjacent bajo settings. The surface of the causeway appears to have been covered by these sediments during the seasonal inundation of this depressed setting. The

black gumbo appears to be thicker on the eastern most end of the feature than on the western end, possibly reflecting a more recent siltation of the deeper bajo located on this side of the sacbe. The natural excavation level was terminated upon exposing the continuous layer of limestone cobbles and small boulders defining the present surface of the sacbe. The width of the sacbe revealed in plan was 6.8 m., though the absence of well defined curbstones suggest that the width was somewhat exaggerated as a consequence of lateral slumpage.

The lower level represents a construction core of the feature. Only the eastern half (a 1 x 4 m. unit) was sectioned. The rubble cap (30 to 40 cm. thick) was found to overlay a light grey glei clay. The original surface of the feature appears to have suffered from severe erosion producing a leached and mottled profile. The dark gumbo clay characteristic of the upper bajo sediments filtered through the profile as did a system of rootlets. However, there is some evidence for an extremely mottled paleosol capping the underlying sterile matrix. The underlying grey clay appears to be a sterile naturally occurring deposit analogous to the less friable matrix overlying the caprock (see Freidel and Scarborough n.d.).

The composition of the sacbe suggests that it was not a labor intensive building project, but rather a result of the energy invested in the excavation of the

adjacent depressions which define its margins. Although detailed soil analysis has not been carried out, our field indications suggest that the basal sediments in our exposure have not been altered or built up. The *sacbe* appears to have been deliberately isolated as a linear island following the postulated quarrying activities on either side of it. The limestone rubble cap is believed to have stabilized the surface which was less cambered than it is today.

Structure 38

This structure rests within a well drained *huamil* setting. The ground is generally elevated but riddled with pits and shallow quarry scars. It appears to have undergone limited quarrying activity, perhaps as a consequence of exhausting other caprock locations in proximity. Structures 37 and 105 which are both within 100 m. of Structure 38 appear to be stockpiles of limestone construction fill rather than occupation facilities. Two poorly defined well-like features occur immediately to the southeast of Structure 38 as well as an amorphous depression speculated to have been a *sascabera*. Structure 38 is one of the larger structures in this location, but unlike mounds of this size it appears to be constructed primarily of earthen fill.

The mound has been assigned a Co'h phase date which suggests that extensive quarrying of the caprock

was seldom undertaken in this phase, perhaps reflecting the absence of social mechanisms necessary to prevent damage to the fragile drainage system at the site. Earth fill is obtainable by simply scraping the surface of the decomposing caprock over a rather extensive area. However, this practice would eventually force the occupants to quarry for new mound fill as the earth fill would be exhausted relatively quickly. A Tulix occupation as well as an ephemeral Classic and Postclassic reoccupation of the mound was demonstrated. Judging from the trash lens of Co'h phase debris, the mound is identified as a house locus. This is a Type 4 mound. A shell scoop and a digging stick weight have been identified from our exposure. (See Fig. 27.)

Structure 38A (Operation 119)

Structure 38 is 28 m. long, 24 m. wide and 1.3 m. high. It has a potential summit floor space of 100 m^2 and an absolute volume of 502 m^3. During the 1978 season a north/south oriented 2 x 2 m. unit was located on the northeast slope of the mound. This location was selected because of the possibility of contacting architecture (i.e. a retaining wall) as well as midden debris. Our site map and lateral stripping excavations suggested that many of the features in the intrasite zone were oriented to the center proper rather than true north. Given the prevailing southeasterlies, midden debris was predicted

at this location. This latter hypothesis was realized but only by a moderately dense sheet midden deposit. (See Fig. 27.)

Five naturally occurring levels were lotted into six corresponding sub-units. The surface level was a thin, dark grey clay A-horizon underlain by a poorly developed, friable, light grey B-horizon. The profile was quite mottled and subject to leaching. The second level represented a tan marl intruded by unworked fall stones. These stones are thought to be associated with the original Preclassic occupation of the mound, while the surface level is understood to be a Postclassic mantle.

The third level appears to be unsealed construction fill consisting of light grey marl intruded by limestone gravel. It can be differentiated from the above matrix by the smaller size and greater quantity of stone as well as the slight color distinction between the two lenses. However, the boundary between the two matrices is not abrupt indicating the mixed context of all recovered debris from these lots.

Level four represents the same light grey marl, but containing cobble size and larger rubble coring to the west or the interior of the mound and unintruded clays to the east. Although no retaining wall was defined, this lateral matrix division may correspond to

the original limits or perimeter of the mound. The debris isolated from both contexts reveal a clear Co'h phase date for this construction. The interior lot of level four was underlain by a thin (2 cm. thick) white marl "preparatory surface" as defined elsewhere in the settlement. The outside or eastern exposure produced no such deposit.

The lowest level defined was a sterile black paleosol which was underlain by a yellowish parent limestone material. Although these depths were only post hole probed, the interior or southwestern corner of the exposure revealed the black paleosol to be 40 cm. thick, while the southeastern probe indicated a shallow 5 cm. thick paleosol. This may suggest a deliberate attempt to infill an interior depression underlying the mound prior to the construction of the substructure by simply scraping the adjacent ground surface for fill.

Although Structure 38 was not completely composed of earth fill, the bulk of the mound is suggested to have been light grey marl. This matrix would have been easily obtained from the adjacent ground surface without a concentrated quarrying effort, suggesting the constraints placed on monumental architecture during this phase.

Structure 66

This structure rests on an elevated island of well drained <u>huamil</u> flanked by broad runoff thornscrub

depressions. This raised ground is suggested to have been surrounded by the drainage depressions channeling the central precinct run-off. The mound was test excavated because of its isolated position given the number of large mound clusters in this vicinity. Structure 66 is a Type 4 mound. The mound is argued to be of Tulix phase construction with a very ephemeral Classic and Postclassic reoccupation. Judging from the amount of debris, the mound has been tentatively identified as a house. (See Fig. 19.)

Structure 66A (Operation 122)

This structure is 24 m. long, 17 m. wide and 1.5 m. high. It has a potential summit floor space of 80 m^2 and an absolute volume of 366 m^3. During the 1978 season a 2 x 2 m. test unit was located on the northwest slope of the mound. Subtle surface contours suggested the possibility of an outset staircase along the north-south inset of this postulated feature to expose trash and fall trapped in this context. Again our test was located to maximize both our architectural knowledge as well as to obtain dateable trash. The unit was oriented to magnetic north. (See Fig. 29.)

The unit was divided into three levels consisting of four lots. A dark brown clay loam A-horizon intruded by cobble size and larger fall defined the surface level. This matrix graded into a light friable loamy clay

intruded by decomposing fall. This second level appears to represent fall associated with the initial occupation of the mound as well as later occupational mixing. Some of the fall may be from the underlying western wall exposure as well as the summit superstructure.

Level three was defined by two culturally significant lots. A 20 cm. thick, dark grey clay lens of primary midden debris was isolated and removed outside a crudely faced wall. Bone, ash and charcoal were collected from this context. The other lot represented the sectioning of the wall exposure. This latter operation demonstrated that the midden deposit was associated with the wall construction and did not underlay the wall. The wall is oriented north/south in the west profile of the unit. It was 40 cm. high consisting of cobble size and larger stones composed of three ill-defined courses. It was caked with poorly preserved plaster melt or sascab. A chunk of red painted plaster was collected. The matrix outside the wall contained faced fall stones overlying the darker midden clays. No white marl "preparatory surface" was defined. The dark grey clay loam was underlain by the sterile light grey parent matrix. The slight slope of this original land surface suggests that the mound was raised on a slightly elevated setting initially.

Although little can be made of the exposed architecture relative to the surface contours of the mound,

the position and orientation of the wall fragment is not unlike the patio wings or extensions revealed on Structure 11B. The wall fragments may be the interior inset behind and below a western facing veranda.

Structure 65

Structure 65 rests on an elevated huamil setting shared with Structure 120. This area is surrounded by thornscrub with an eliptical catchment basin defining the southern margin of the elevated huamil. In plan, the mound bears a similar northern orientational relationship to Structure 29 and ballcourt Structure 61 Group as does the more southern Structure 53 to Structure 29 and ball-court Structure 50 Group. The mound was selected for study because of its position in the settlement. (See Fig. 13.)

Although no midden debris was isolated, sealed construction fill has provided a Co'h and/or Tulix phase date. The mound was of the Type 4 class. A Classic and Postclassic reoccupation of the mound is evidenced. (See Fig. 30.)

Structure 65A (Operation 138)

Structure 65 is 31 m. long, 23 m. wide and 1.5 m. high. It has a potential summit floor space of 108 m^2 and an absolute volume of 161 m^3. During the 1978 season, a 2 x 2 m. unit was placed on the south central margin of the mound. This is believed to be the backside of the

mound. Again, the strategy was to define dense midden debris outside the structure and architectural features within. The unit was oriented to magnetic north. (See Fig. 31.)

Five naturally defined levels divided into six lots comprised the entire strata. The upper dark brown humus loam was intruded by cobble size and larger fall stones. This level graded into an underlying light brown loam intruded by additional fall and plaster melt. In the northwest corner of the unit a 20 cm. thick deposit of melt was isolated. It would appear to have slumped away from a superstructure located a meter or less to the northwest higher up on the mound. The consolidated chunks of plaster melt as well as the remainder of the level lay on a hard plaster floor. The 3 cm. thick hard plaster floor was well preserved over the northern three-quarters of the unit but disintegrated and slumped to the south. However, sufficient quantities of decomposed plaster were isolated to indicate that the entire unit was formerly covered by plaster flooring.

Level three underlying and including the plaster floor was lotted into two discrete sub-units. This matrix was approximately 60 cm. thick resting on sterile clays. The northern three-quarters of the unit was separated from the southern portion in order to obtain a sealed ceramic sample. A friable light grey clay loam

intruded by numerous pebble size gravels defined the upper 10 cm. of hearting underlying the floor. This matrix graded into a cobble size and larger fill, loosely packed in the same light grey clay loam. The southern portion of the level was slightly darker in hue, probably as a consequence of root and soil disturbance from above through the poorly preserved portions of the plaster floor.

The basal level was defined by the sterile, granular, light grey loam parent matrix. Except for a small patch of dark brown paleosol restricted to the southeast corner of the unit, the bulk of the mound is predicted to overlie the decomposing caprock surface. This suggests that the surface of the caprock was scraped clean of its topsoil accumulation prior to mound construction. Although this thin, organic rich deposit may have been removed for any number of unknown cultural preferences (see Structure 38), it is speculated that this fill was relocated and used on adjacent agricultural plots (see Turner et al. 1980).

Structure 65 is postulated to have functioned as a non-residential facility. This identification is based on very slim evidence, but is suggested on grounds of the spatial relationship it manifests with the structures mentioned above. Although the hard plaster floor unassociated with domestic trash can be argued to represent sampling error, it is predicted that little midden debris

will be collected from this mound if further exposure is undertaken.

Structure 53

This structure is a Type 4 structure located in the same relationship (to the south) with Structure 29 and the ballcourt Structure 50 Group as Structure 65 is to Structure 29 and the ballcourt Structure 61 Group (to the north). (See Fig. 13.) The structure is nearly surrounded by depressed zacatal and thornscrub savanna. Except for a strip of elevated ground to the south, the structure can be viewed as an island. The large size and isolated location of the structure suggest that it was not a residential locus but a civic facility. Ceramics taken from construction fill indicate a Co'h phase construction although a Tulix phase, as well as an ephemeral Classic and Postclassic, occupation is indicated. (See Fig. 32.)

Structure 53A (Operation 123)

This structure is 32 m. long, 30 m. wide and 3.0 m. high. It has a potential floor space of 72 m^2 and an absolute volume of 1548 m^3. During the 1978 field season a 2 x 2 m. test unit was excavated to a maximum depth of 1.9 m. The unit was placed on the northwest flank of the structure next to an outset medial ridge on the west side of the structure. This inset location was anticipated to yield midden debris in addition to

architectural detail. Neither expectation was realized. The unit was oriented N45°W. (See Fig. 33.)

The strata were divided into eight lots within four naturally occurring levels. The surface level was defined by a dark brown A-horizon loam intruded by gravel and fall stones. Level two was defined as a grayish brown loam surrounding cobble size and larger rubble coring. This level comprised the bulk of the mound, it being 130 cm. thick and underlain by a thin "preparatory surface." The upper fill in the eastern portion of the unit consisted of compacted gravel size ballast suggestive of the hearting used below a floor. No plaster was noted, however. A crude poorly defined alignment of boulders was discernable in the western portion of the unit trending north/south at the base of the level, although no retaining wall was defined. The ballast in the lower reaches of level two graded into a tan loam intruded by gravel size ballast.

Level three consisted of a 3-5 cm. thick lens of dark grey loamy clay identified as a "preparatory surface" overlying the sterile paleosol. Level four was defined as the sterile matrix below the mound. The paleosol was a non-sticky, mottled, light grey clay loam unlike that found elsewhere. Our post hole probe indicated that it was approximately 40 cm. thick and underlain by decomposed parent material. Forty centimeters below the surface of

this yellow parent material an underground solution-like cavity was detected. It was shallow and dry as a consequence of the dry season.

The excavation did not identify the function of the structure. However, its size, isolation and relationship to Structure 29 and the Structure 50 Group suggest that it had a non-residential nature during the Tulix phase. It may have been a house locus in Co'h times.

Structure 116 Group

This structure group rests within the *hulub bajo* outside and northeast of the main canal. The four structures in this group appear to be oriented to the cardinal directions or towards the central precinct and rest on a low platform. Judging from our test unit, the elevated platform is perhaps best seen as the original ground surface with the surrounding matrix having been culturally or naturally removed. The group was tested because of its position and architectural complexity outside the canal and within the poorly drained *hulubol*. Its proximity to the coast was also considered important given the trade network postulated for Cerros. The group is argued to have functioned as a residential plazuela, perhaps monitoring raised field agriculture outside the canal. A Co'h and Tulix phase date has been assigned to the group, although the sherd inventory collected was small. An

ephemeral Postclassic occupation is evident. The group is a Type 1 form. (See Fig. 34.)

Structure 116B (Operation 127)

Structure 116B is the largest and western most mound in the group. It is 23 m. long, 22 m. wide and 2.2 m. high. It has a potential summit floor space of 120 m^2 and an absolute volume of 689 m^3. During the 1978 season a 2 x 2 m. test unit was placed on the south-western backside of the mound and excavated to a maximum depth of 1.6 m. The test unit was positioned to expose both architecture and/or midden debris located on the slope of the mound. Neither of these objectives was well realized. The unit was oriented to magnetic north. (See Fig. 35.)

The strata were lotted into three naturally occurring levels. The upper level was a dark brown loamy clay A-horizon heavily intruded by roots and numerous small boulder size limestone fall. The level was badly disturbed and may include construction fill. It was noted that the consistency of the limestone rubble was more dense than recorded in other excavations. This may suggest a slight change in the local limestone caprock taken from the eastern margin of the site.

Level two consisted of a mottled light grey clay loam intruded by assorted limestone ballast. This level defined the construction core of the mound. Pebble size

hearting was concentrated in the northern or mound interior portion of the unit. The southwestern portion of the unit contained an off-white marl with few limestone inclusions.

The third level defined the base of the mound. The "preparatory surface" was isolated as a continuous granular yellow clay ranging from 2 to 3 cm. thick. The underlying dark brown paleosol was 10-15 cm. thick and in turn underlain by the sterile gray clay parent material.

The structure did not reveal a dense midden deposit or clear architectural detail. However, given its distance from the center and by analogy to other plazuela groups in the lowlands, it is thought to have functioned as a residential cluster. The structure group's position within the _bajo_ strongly suggests its role in raised field agriculture. The size and formal complexity of the group may suggest that a managerial elite resided at this location. Even allowing for subsidence and erosion of the shoreline, the proximity of the coast would have permitted petty riverine exchange.

Structure 115 Group

This group of three structures lies 150 m. south of the Structure 116 Group, resting east and outside the main canal segment. The plazuela group is located on an elevated _monte alto_ setting and surrounded by _hulubol_.

The group orientation may be toward the central precinct. The group is tentatively defined as a residential facility analogous to the Structure 116 Group. Immediately to the west of the plazuela is a problematic mound which may be the remains of an ancient raised field platform. It was entirely circumscribed by linear depressions. A Co'h or Tulix phase date has been assigned to the construction of this group, though an ephemeral Classic and Postclassic occupation is apparent. (See Fig. 36.)

Structure 115B (Operation 128)

Structure 115B is the largest and eastern most mound in this Type 2 plazuela. The structure is 19 m. long, 14 m. wide and 1.2 m. high. It has a potential summit floor space of 100 m^2 and an absolute volume of 200 m^3. During the 1978 field season, a 2 x 2 m. unit excavated to a maximum depth of 1.1 m. was located on the southwestern slope of the structure. Our unit was located to reveal both architecture and trash debris just off the estimated medial axis of the mound. (See Fig. 37.)

Four naturally defined levels were divided into seven lots. The surface level consisted of a dark brown clay loam A-horizon intruded by limestone gravel and root disturbances. A poorly developed grey clay B-horizon intruded by additional gravel defined the next level.

The upper strata represented a mixed surface accumulation of fall debris.

Level three was defined by the exposure of a single course ramp of foot stones trending northeast to southwest and contouring to the slope of the mound. The ramp consisted of five smooth, tabular, small boulders oriented in a line from the summit of Structure 115B to the foot of Structure 115D. The matrix outside or to the southeast of the ramp was a dark gray clay grading to a dark brown clay containing few limestone inclusions. The lower reaches of this deposit appear to represent a 25 cm. thick midden concentration. Small concentrations of ash, bone and shell were collected in addition to the Tulix phase ceramics. The deposit was mottled by flecks of sascab apparently having weathered from the eroded superstructure above. The matrix inside and underlying the ramp stones was a grey clay loam intruded by gravel size ballast. Although we have tentatively identified an underlying deposit of dark brown paleosol contaminated by sherd migrations from above, a thin deposit of midden-like soil may underlie the interior of the ramp area. The matrices at the basal level of this exposure were badly leached and mottled as a result of the fluctuating high water table. A thin poorly defined white marl "preparatory surface" is present, overlying the paleosol. The

sterile decomposing grey clay loam parent material was found under the paleosol.

This mound group is postulated to have functioned as a residential area for a non-elite kin unit. Both the small size of the plazuela and the poor quality of architecture suggest that the occupants were of the service class. Given the proximity of the adjacent _bajo_, it is further suggested that the occupants secured a living from the _bajo_ setting. The high ground on which the Structure 115 Group rests is argued to represent the eastern most extent of quarry and canal maintenance at the site. It is unlikely that the managerial elite at Cerros would have allowed the service population characterized by the Structure 115 Group to occupy this elevated _monte alto_ setting if this area were at a premium for additional fill or drainage.

Structure 46

This plazuela of two lies approximately 50 m. to the southeast and outside the canal. It is 70 m. east of a causeway or check dam bridging the canal. The group rests in a _monte alto_ setting, but it is flanked on three sides by _huanal_. The structures face one another northeast/southwest and rest on a raised plaza. This orientation runs parallel to the nearby canal axis. Although Tulix phase ceramics were well represented in the excavation, a clear Early Classic date has been

obtained for this group from a sealed construction fill context. An ephemeral Postclassic occupation is also apparent. Although this plazuela was constructed in the Early Classic, the amount of Late Preclassic debris suggests the presence of a Tulix phase construction in this vicinity. A ground level Tulix dwelling is predicted. The Structure 46 Group is a Type 3 structure. Ten net weights have been collected from this structure and date to the Early Classic period. (See Fig. 38.)

Structure 46C (Operation 129)

Structure 46C is the smaller and northeastern most structure in this plazuela. It is 25 m. long, 16 m. wide and 1.1 m. high. It has a potential summit floor space of 80 m^2 and an absolute volume of 264 m^3. During the 1978 field season a 2 x 2 m. unit excavated to a maximum depth of 1.4 m. was located on the southwestern margin of this structure. This location was estimated to straddle the medial axis of the mound. Both architecture and midden debris were anticipated. The unit was oriented N45°W in keeping with the orientation of the group. (See Fig. 39.)

Five naturally occurring levels were divided into seven lots. The surface was defined by a well developed dark brown clay loam A-horizon intruded by cobble size and larger fall. The second level consisted of a light gray clay loam heavily intruded by fall in the upper

reaches and gravel ballast in the lower reaches. A substructural retaining wall was revealed in the eastern portion of the unit. This inset/outset alignment consisted of three segments cornering at right angles running perpendicular and parallel to magnetic north. The wall was only a single course high (except for two courses in the north), but was composed of finely faced stones. Although weathered and mixed from above, the masonry appears to have been chinked with sherds and covered by plaster. A very poorly preserved flagstone floor appears to have abutted this retaining wall. It in turn was underlain by 25 cm. of gravel ballast. The level was terminated upon exposing a hard plaster floor which extended across the entire unit and under the above retaining wall. This floor, however, was not well preserved in the western portion of the unit.

Level three was defined as the construction fill underlying and including the hard plaster floor understood to be the raised plaza surface. Six centimeters below this floor lay a yet harder floor. Although this latter floor may represent the underflooring for the plaza surface, its hardness suggests that the plaza area may have been refurbished at a later date. The southern portion of the floor was again poorly preserved.

The lower floor was underlain by 5-10 cm. of hearting gravel in a friable light grey clay loam. A

grey loam intruded by loosely packed smaller boulder size rubble underlay the floor ballast. A crude two course high construction pen wall was located in the center of the unit trending north/south and parallel to the above substructural retaining wall. This construction wall secured the plaza surface and apparently prevented slumpage of the floor in the eastern portion of the unit. The base of level three was defined by a thin white "preparatory surface" which was apparent in the northern portion of the unit.

Level four was defined by dark grey midden clay loam intruded by cultural debris. This 25-30 cm. thick deposit dates to the Early Classic period. This midden deposit underlying the plaza suggests an early and a late construction and occupation of this area within the Early Classic.

The basal level consisted of a dark grey to brown paleosol which was underlain by sterile grey clay parent material.

The Structure 46 Group is the only well documented and unequivocal Early Classic small structure reported at Cerros, although reoccupation or reuse of Late Preclassic period mounds is common. Other Early Classic structures have been suggested but the dates must be considered tentative. Two construction/occupation events are documented at this structure. The earliest is associated

with the midden debris. Whether or not it is a primary or secondary context deposit, it implies that the immediate vicinity was lived on by Early Classic residents prior to the construction of the plaza and Structure 46C. The later construction reflects a continuous occupation of the area culminating in the exposed architecture. The "preparatory surface" suggests an affinity to the Late Preclassic practice of spreading this white marl across a site before the onset of construction.

The Early Classic occupation of the settlement is not well defined and usually quite ephemeral. However, the presence of the Structure 46 Group may suggest a continuity in tradition from the Preclassic florescence at Cerros. If smaller Early Classic populations maintained small well drained plots and were perhaps directed by a few managerial families, then the Structure 46 Group may represent a "rural elite" residence.

Structure 94

This Type 5 mound lies within the <u>huanal</u>, approximately 40 m. south and outside of the canal. The diminutive size and isolated position of the mound coupled with the Classic and Postclassic debris suggest that Structure 94 was a farmstead constructed following the Late Preclassic abandonment of the site. Over two dozen Postclassic net weights have been collected from this mound. (See Fig. 40.)

<u>Structure 94A (Operation 135)</u>

This structure is 17 m. long, 11 m. wide and 0.4 m. high. It has a potential summit floor of 187 m^2 and an absolute volume of 75 m^3. During the 1978 field season a 2 x 2 m. unit was placed on the eastern flanks of the mound. We placed the unit next to a concentration of limestone rubble in an attempt to reveal a possible retaining wall. Unfortunately, no architecture and little midden debris was identified. The unit was oriented to magnetic north. (See Fig. 41.)

Only one lot and one level were defined in the 80 cm. of vertical exposure. The matrix consisted of a dark brown clay loam A-horizon grading into a lighter B-horizon. Both horizons were intruded by fall stones and rubble coring. The western portion of the unit contained a greater frequency of gravel size ballast than the eastern portion, indicative of construction fill. This suggests that our unit straddled the edge of the substructure though no formal retaining wall was apparent. The mound was placed on a black clay paleosol underlain by a grey clay parent material.

The mound is thought to have functioned as a residential facility during the Classic period and again in the Postclassic. The presence of Tulix phase ceramics suggests that this zone was also utilized in the Late

Preclassic, but no mounded features were associated with this period.

Structure 77

The Type 6 structure rests 60 m. east/southeast of plaza Structure 8A in a well drained huamil setting. The mound occurs in an area of disturbed relief probably as a consequence of high winds and uprooted trees. A portion of the main plaza runoff depression passes to the immediate west. The water table appears to rise in this vicinity as evidenced by the mottled glei-like condition of the soils and the "graham cracker" consistency of the ceramics retrieved. This is further supported by the presence of a recently abandoned well site to the immediate west. This area is unusual in this respect and may have provided suitable drinking water for a segment of the population prehistorically. The mound was dug as much to increase our Type 6 count as to test the prospect that some of these very small mounds were not the result of human energies. The majority of sherds collected from the mound date to the Postclassic period. (See Fig. 40.)

Structure 77A (Operation 145)

This structure is 8 m. long, 7 m. wide and 1.0 m. high. It has a potential summit floor space of 9 m^2 and an absolute volume of 33 m^3. During the 1978 field season a 2 x 2 m. unit excavated to a maximum depth of

1.0 m. was located on the eastern flank of the mound. The position of the unit was a rather arbitrary decision, though midden debris was anticipated in this area. (See Fig. 42.)

Although the exposure was badly mottled, two natural levels were discernable. The upper dark humus clay loam A-horizon was a poorly defined accumulation of fall debris and construction fill. The support ballast was gravel size and loosely packed. The yellow and brown mottling of the soil horizon suggests the effects of a high seasonal water table. The lower level graded into a viscous grey clay not unlike the sediment removed from the infilled canal excavation. These clays were strongly influenced by the effects of waterlogging. The mound was underlain by the grey clay parent material defined elsewhere. The absence of a dark paleosol was noted.

This mound is understood to be a Postclassic construction at the foot of the main plaza. Although the high water table may have posed some problems for the occupants, the proximity of a potentially potable water source may have outweighed any disadvantage. The mound is viewed as a Postclassic domestic facility. The absence of the paleosol this close to the main plaza during the Preclassic might be predictable, but its absence during the ephemeral Postclassic occupation of Cerros is more puzzling. Although the construction ballast was neither

dense or homogeneous, the feature is argued to be a cultural facility.

Structure 26

This Type 6 mound is located in a huamil setting in close proximity to Structures 25, 26 and 28. The caprock in this area is exposed in some locations. However, the soil overlying it is quite moist apparently due to the drainage depressions surrounding the area. The mound is interpreted as a domestic dwelling constructed during the Co'h phase. It appears to have been utilized in Tulix times and only much later reoccupied during the Postclassic period. The mound has been disturbed by post-depositional agents, although our test unit was placed away from the most obvious disturbances to the south. The mound was selected for excavation because of its formal and spatial affinity to the other mounds in proximity. The assumption was made that the other mounds might reflect similar functions. (See Fig. 43.)

Structure 26A (Operation 140)

This structure is 12 m. long, 12 m. wide and 0.5 m. high. It has a potential summit floor space of 24 m^2 and an absolute volume of 42 m^3. During the 1978 field season a 2 x 2 m. unit was excavated to a depth of 95 cm. The unit was placed on the northern flank of the

mound as much to avoid the obvious disturbed portion of the structure as any other reason. The unit was oriented to magnetic north. (See Fig. 44.)

The strata were lotted into four naturally occurring, although poorly defined levels. The surface level consisted of a dark clay loam A-horizon intruded by gravel size fall. This graded into the second level or grey clay loam intruded by cobble size and larger rubble fill. The southern portion of the mound was defined by a gravel size construction core. Level three consisted of a light grey clay marl understood to be the decomposing parent matrix, although a few migrating sherds were collected. The basal level defined the upper reaches of the solid limestone caprock. The absence of a paleosol suggests its deliberate removal.

Structure 26 appears to represent a residential facility. It appears to reflect the centrifugal force pulling the Co'h phase occupants away from the Ixtabai phase nucleated village. The absence of a paleosol at this location would suggest the deliberate removal of this deposit perhaps in a manner suggested for Structure 38.

Structure 24

This Type 6 structure rests at the northern end of the sacbe (Feature 126) at the margin of the depressed zacatal. The structure lies in a well drained huamil

setting at the southern reaches of plaza 9A. Structure 24 is interpreted as a Co'h phase construction reoccupied in Tulix as well as Classic and Postclassic times. The function of the mound is equivocal but its small size and association with Structures 13, 14, 15 and 16 at the edge of the plaza 9A may suggest an outbuilding or service population residence. (See Fig. 45.)

Structure 24A (Operation 132)

Structure 24 is 11 m. long, 10 m. wide and 0.5 m. high. It has a potential summit floor space of 16 m^2 and an absolute volume of 32 m^3. During the 1978 field season a 2 x 2 m. unit was excavated to a depth of 1.0 m. It was located on the eastern flank of the structure in anticipation of midden debris and/or architectural exposure. The unit was oriented to magnetic north. (See Fig. 46.)

The strata were divided into five lots consisting of four naturally occurring levels. The surface level was a dark brown humic loam intruded by cobble size fall stones. This was underlain by a stone platform edge in the western portion of the exposure. This feature was poorly defined but appears to have been covered by small tabular boulders a course or two high (20 cm. maximum). The matrix outside and east of this stone concentration was the same humic deposit as found above. This feature

is believed to be associated with the Postclassic reoccupation of this mound.

Level two consisted of a grey clay loam intruded by cobble size construction fill. A couple of large stones in the southwestern corner may be the remains of a Co'h phase retaining wall but additional exposure is necessary. At the foot of these stones (level three), we located an associated thin midden deposit not unlike those defined elsewhere under plaza Structure 9A. Charcoal and bone were collected. Level four was identified as the underlying sterile grey parent material. No preparatory surface or paleosol was noted.

This structure was excavated because of its size and proximity to the relatively larger mounds of this zone. The absence of a paleosol suggests the deliberate removal of this topsoil prior to construction. Again, it may suggest the premium placed on the soil itself, perhaps for agricultural fields. The Co'h phase occupation of this mound appears to be at ground level.

Structure 112

This structure lies on the edge of the present bay approximately 200 m. east of the main plaza. It rests on a well drained huamil setting, though it is flanked on three sides by hulub. An apparent run-off channel passes south of the structure and may drain into the main canal. The structure was selected for excavation

because it was uniquely located on the shoreline and hypothesized as having been involved in direct maritime exchange. The structure dates to the Tulix phase, though a Postclassic reoccupation is indicated. In addition to the mound, our excavations demonstrated the presence of ground level occupation during the Tulix phase. It was sealed by the overlying structure. It should be noted that the northeastern portion of the mound may have been robbed of rubble fill in recent history. (See Fig. 47.)

Structure 112 (Operation 117)

This Type 4 structure is 32 m. long, 18 m. wide and 1.6 m. high. It has a potential summit floor space of 98 m^2 and an absolute volume of 539 m^3. During the 1978 field season a 3 x 3 m. unit was initially opened to a depth of 1.7 m. At this elevation the unit was reduced to a 2 x 2 m. exposure located in the southwest corner of the unit and further excavated another 20 cm. The location of the unit was on the northern flank of the structure. Although no architecture was visible, our test unit straddled an outset "ridge" trending north/south down the medial axis of the mound. We anticipated midden trash preserved in the hypothesized inset of the staircase or ramp as well as a retaining feature. Neither expectation was met. The unit was oriented to magnetic north. (See Fig. 48.)

The strata were separated into nine lots consisting of six naturally defined levels. The surface level consisted of a friable dark grey loam A-horizon intruded by pebble size and larger fall and construction fill. Although no architecture was revealed, the western portion of the unit (corresponding to the hypothesized outset) consisted of a light grey loam containing compacted pebble-size ballast. The second level was defined by a grey clay grading to a white marl intruded by gravel and small boulder fill. This level was taken down 1.4 m. BSD and represents the bulk of the mound core. Level two was terminated upon exposure of a soft <u>sascab</u> floor (F1) underlying the mound. The matrices underlying level two were quite moist as a consequence of the nearby bay water levels.

Level three was a friable light grey loam including and underlying the 3-5 cm. soft floor (F1). Twenty centimeter of gravel size ballast were located overlying a second <u>sascab</u>/plaster floor (F2). The ballast supporting the upper floor (F1) was best defined in the western third of the unit. The southwest corner was disturbed by a post-depositional intrusion apparently occurring before the mounded feature was constructed.

Level four was defined as the light grayish brown loam including and underlying the second floor (F2). Less gravel ballast was found to support this floor than

the upper floor (F1). The floor was mottled and poorly preserved throughout the unit, though the western portion was slightly better preserved. The surface exposed patches of yellowish orange and grey discoloration associated with burning, not unlike the tierra quemada floors of the midden village. The southwest corner was disturbed by the same post-depositional intrusions as mentioned above.

Level five represents a poorly defined soft plaster/sascab floor (F3) and its underlying midden debris ballast. The floor appears to have been smoothed over the unleveled ballast as indicated by the variable depth of the floor across the unit. The midden debris does not appear to be a primary deposit, judging from the small size of the sherds. Charcoal as well as fire-cracked limestone ballast were noted, indicative of an earlier tierra quemada flooring event. The intrusion in the southwest corner of the unit consisted of a grey sandy marl intruded by gravel at this level.

Level six was defined by the dark grey clay paleosol found under most of the structures at Cerros. However, a few artifacts appear to have migrated down from the upper levels. In the southwest corner of the unit underlying floor 3 and intruding the paleosol into the underlying sterile parent material, we isolated a burial (B27). The disturbance through the three floors

(F1-3) noted above is not associated with the burial. The burial appears to be associated with the third floor (F3) as the floor is present although very poorly preserved above this feature and the ballast support for the floor is lacking. The matrix encasing the individual was a mottled mixture of dark grey clay, white marl and brown loam. The burial was taken from the level of the water table and was not well preserved. The sex, age and stature are unknown at this writing. The individual was interred without furniture in a semi-flexed position with the cranium oriented to the northeast.

Structure 112 presents a rapid developmental sequence involving four constructional events occurring within the Tulix phase. Although the precise function of the mound is not well understood, the docking facility hypothesis cannot be discounted. A possible canoe anchor weight has been reported from this structure (Garber personal communication). The underlying three floors and associated burial best describe a ground level residential locus early in the phase. Most researchers suggest that burials in small structures indicate a household function for the mound. It has been shown in this and other contexts that Co'h and early Tulix phase ground level dwellngs later established mounded structures over them. This practice would appear to be a comment on kin spatial continuity through time. The mound in these cases

represents the establishment and assertion of greater family authority within the community.

Structure 54

This Type 4 structure rests at the north end of the eastern _Sacbe_ 2 or plaza edge (Feature 51). The structure lies in an elevated _huamil_ setting, although thornscrub lies in the immediate vicinity. The structure was tested because of its imposing size as well as its location at the end of the _sacbe_. The site is not understood to have served a residential function, but it is hypothesized to be public architecture. The mound was constructed during the late Tulix phase. This date accords well with Structure 29 at the south end of the _sacbe_ or plaza edge and provides a tentative date for the _sacbe_ itself. (See Fig. 49.)

Structure 54A (Operation 121)

This structure is 29 m. long, 24 m. wide and 3.5 m. high. It has a potential summit floor space of 80 m^2 and an absolute volume of 1358 m^3. During the 1978 field season a 2 x 2 m. unit was placed on the southeast flank of the mound in an attempt to isolate an architectural retaining feature as well as expose any trash deposit immediately outside the structure. The unit was excavated to a maximum depth of 3.2 m. The unit was oriented to magnetic north. (See Fig. 50.)

The strata were divided into six lots within these naturally defined levels. The surface level consisted of a dark brown A-horizon loam grading into a poorly developed grey B-horizon clay loam. A few fall stones were removed from this matrix. The level was terminated upon exposing four well defined risers each consisting of 3-4 courses of loaf shaped stones. The lower two risers were better preserved than the upper two, each attaining a maximum height of 50 cm. The treads were not well preserved, except for a white marl lens at the foot of the lowest riser. The entire feature appears to be an eastern facing staircase, although the mound contours may suggest that it is an uninterrupted decorative technique flanking the four sides of the mound. It should be noted that an ill defined alignment of faced stones was located in the northern profile trailing east/west down the structure and overlying the risers. They may be nothing more than fall stones, but by analogy a Late Preclassic balustrade has been reported at Komchen (Andrews IV n.d.) and Uaxactun (Ricketson and Ricketson 1937).

Level two represents the rubble core of the structure underlying the exposed architecture. This matrix consists of cobble size and larger ballast, roughly flat laid and packed in a friable light grey loam grading to a viscous greyish brown loam. A well defined

construction pause immediately underlays the basal riser and corresponds to the marl surface at the foot of the basal riser noted in level two. The rubble underlying the construction pause was larger and more randomly placed than that above, although the marl flooring associated with the basal riser was supported by a 10-15 cm. thick lens of gravel hearting. At 2.9 m. BSD the level was terminated upon exposing a thin lens of soft white sascab/plaster. The northern edge of the unit did not reveal this lens, so it was leveled off somewhat arbitrarily.

Level three was defined as soft plaster and underlying grey silty clay. The soft plaster was 5-7 cm. thick and immediately supported by a thin deposit of gravel hearting. The underlying grey silty clay was found to overlie the dark brown gumbo paleosol. An increase in sherd debris may indicate that this soft plaster was an earlier ground level residential facility. However, this surface dates to the same ceramic phase as the overlying mound and probably reflects a "preparatory surface" for the mound.

Structure 54 is believed to be a Tulix phase monument and a civic facility. The date is not unequivocal due to the presence of Early Classic debris in low frequencies on the upper reaches of the mound. However, these sherds are argued to be a consequence of vertical

migration due to the decomposed nature of the upper tread surfaces. Only Preclassic ceramics were taken from the lower 2.2 m. of fill.

Structure 57

This Type 6 structure lies near the center of the Sacbe 2 or plaza edge defined in the eastern intrasite area (Feature 51). The mound lies in a huamil setting, but at the margin of a thornscrub environ. The structure was excavated to augment our Type 6 sample as well as provide a cross-section of the underlying sacbe on which it rests. The structure is understood to be a non-residential facility on the grounds of its diminutive size and its central position on the sacbe. Our sherd inventory from unsealed construction fill suggests that the mound dates to the Co'h phase as does the underlying sacbe. Classic and Postclassic reuse of this facility are also indicated. (See Fig. 40.)

Structure 57A (Operation 144)

This structure is 13 m. long, 9 m. wide and 1.0 m. high (including the underlying sacbe). It has a potential summit floor space of 16 m^2 and an absolute volume of 67 m^3. During the 1978 field season a 2 x 2 m. unit was excavated to a maximum depth of 1.2 m. The unit was placed at the summit of the mound in anticipation of features, but none were realized. (See Fig. 51.)

The strata were separated into four lots consisting of six levels. The surface level was a dark brown loam A-horizon intruded by fall and surface accumulation. Level two was defined by the same brown loam as identified in level one, but a construction fill consisting of gravel size ballast was apparent. Level two was terminated upon the <u>sacbe</u> or plaza edge surface. The mound was less than 50 cm. in depth.

Level three consisted of a viscous brown loam intruded by cobble size and larger rubble. Although our exposure was limited, many of these stones appear tabular and horizontally laid in a manner not unlike that noted for the western <u>Sacbe</u> 1 (Feature 126). Level four consisted of the same viscous brown loam mottled by the underlying dark clay paleosol. Gravel size stone ballast contributed to this matrix. Level five represented the thin sterile paleosol and level six exposed the yellowish grey parent material. These latter two levels were simply probed using a post hole digger.

This structure is understood to be a shrine facility or outbuilding of unknown function resting on the <u>sacbe</u> or plaza edge. The surface of the <u>sacbe</u> is ill-defined except for the appearance of the flat laid cobbles.

Structure 13

This Type 4 structure rests on the eastern flank of the low lying plaza Structure 9A south of Structure 9B within a _huamil_ setting. The mound appears to be oriented towards the central precinct as are Structures 14, 15, 16 and the 10 Group; all structures in the near vicinity of Structure 13. The structure lies on the western flank of a shallow runoff channel draining the southwestern central precinct plaza. It is hypothesized to have maintained a non-residential function judging from its large size and spatial relationship with Structure 14 to the immediate southwest. Our excavation has revealed three distinct construction phases on this mound, the most recent being a meter thick mantle dating to the Classic and/or Postclassic. The earlier events are associated with a clear Tulix phase construction. (See Fig. 52.)

Structure 13A (Operation 125)

This structure is 26 m. long, 22 m. wide and 2.5 m. high. It has a potential summit floor space of 25 m^2 and an absolute volume of 746 m^3. During the 1978 field season a 2 x 2 m. unit was excavated to a maximum depth of 2.7 m. The unit was located on the southwestern slope of the structure southeast of the predicted medial axis for the mound. A slight ridge trending southwest/ northeast from the summit of the mound and facing

Structure 14 was argued to be the remains of an outset staircase. Our unit was placed in the adjacent inset to obtain midden debris as well as substructural walls. The unit was oriented to magnetic north. (See Fig. 53.)

The strata were lotted into seven naturally occurring levels. The surface level consisted of a dark brown loam A-horizon intruded by fall stones. Level two was defined by a friable brown loam intruded by gravel to boulder size ballast. Although this matrix is understood to be mound construction core for the reoccupation of the site during Classic or Postclassic times, a few faced stones were noted in the fill. Level three consisted of a light brown loam intruded by small boulder size rubble in the northern portion of the unit. It graded laterally (south) into a grayish brown loam containing few fill stones. At the base of the level, a marl construction pause or decomposed floor was apparent.

Level four was defined as the ballast under the construction pause. The southern portion of the unit revealed gravel size hearting packed in a thick marl matrix. This in turn rested upon a soft plaster or sascab floor (F1). In the southeastern corner, an ancient tree root disturbance had been truncated by the construction pause leveling event. To the north the soft plaster floor (F1) was found to lip up onto a four course high (50 cm.) platform retaining wall. The wall was oriented

southwest/northeast through the center of the unit. It was composed of crudely faced limestone cobbles. The wall was sectioned and found to retain a pebble to cobble size ballast packed in a white marl matrix resting on a continuation of the exterior soft plaster floor (F1) outside the wall.

Level five consisted of the 5-7 cm. thick soft plaster floor (F1) as well as 35 cm. of tightly compacted pebble size hearting underlying the floor. The lower reaches of this fill contained cobble size ballast. This level is thought to be the subplaza Structure 9A and found to underlie most of the mounds in this area. It should be noted that a possible construction pen wall of small boulder size stones was removed from the fill. It would have been oriented north/south in our exposure as indicated in the northern profile. All ceramics sealed behind the retaining wall and below the floor (F1) date to the Tulix phase.

Level six consisted of a dark brown silty clay intruded by a few ballast stones from above. The 10 cm. thick lens represents a primary midden deposit containing numerous large fragments of Tulix phase pottery, charcoal, bone and shell. Level seven was defined as the sterile underlying paleosol clay. It was post hole probed to determine its 15 cm. thick depth as well as the presence of the underlying parent material.

Structure 13 demonstrates four constructional events. The underlying midden deposit is thought to be associated with an early Tulix phase ground level occupation. The ballast supporting and including the sascab/ plaster floor (F1) is understood to represent the southeastern portion of subplaza Structure 9A. This feature underlies most of the structures in this quadrat. The retaining wall is a feature associated with the initial construction of Structure 13. The most recent construction event was a later occupation associated with the Classic and Postclassic reoccupation of the site. The Tulix phase retaining wall was razed except for the extant four courses and, correspondingly, the adjacent area outside the wall was raised. This appears to have occurred sometime after Tulix phase abandonment as evidenced by the truncated tree root disturbance. The overlying fill was poorly consolidated.

Structure 14

This Type 4 structure rests on the eastern margin of subplaza Structure 9A within a huamil setting. The mound shares the same orientation toward the central precinct as the adjacent Structures 13, 15, 16 and the 10 Group. A shallow poorly defined runoff channel draining the main plaza lies to the east. The imposing size, limited summit space and spatial disposition to other mounds suggest that it is not a residential locus.

It should be noted that the southwest side of the mound appears to be terraced. The structure has been assigned a Tulix phase date, although an ephemeral Classic and Postclassic occupation are evident. However, a Co'h phase ground level structure may be suggested. (See Fig. 54.)

Structure 14A (Operation 126)

This structure is 33 m. long, 22 m. wide and 4.5 m. high. It has a potential summit floor space of 40 m^2 and an absolute volume of 1724 m^3. During the 1978 field season a 2 x 2 m. unit was placed high on the northeastern slope of the structure and excavated to a maximum depth of 4.8 m. The unit is positioned in this area to expose midden debris or architectural details east of the medial axis of the mound. The unit was oriented to magnetic north. (See Fig. 55.)

The strata were lotted into nine naturally occurring levels. The surface level consisted of a dark brown clay loam A-horizon which graded into an arbitrarily defined level two. The latter was a friable greyish brown loam. Both were intruded by fall stones and surface accumulation.

Level three was defined by a grey loam intruded by cobble size rubble fall. The matrix was lighter in hue than that above. It appears to represent the fall debris from the final mound construction. Level four

consisted of a thick white marl/melt deposit intruded by boulder size fall stones. The deposit was thicker to the south than to the north contouring to the slope of the mound. It rested upon a soft plaster floor (F1).

Level five was a 15 cm. thick soft plaster floor (F1) and an underlying 1.2 m. thick boulder size dry-laid ballast. A sealed Tulix phase date was obtained from this fill. The floor consisted of a gravel ballast incorporated into the soft plaster. This is understood to be a post-depositional occurrence resulting from the settling of the floor under the porous dry-laid rubble. A construction pause 60 cm. below the soft plaster floor (F1) was apparent in the western portion of the unit, but it feathered out into the eastern rubble fill. The upper portion of the fill produced numerous fragments of painted hard plaster including one large molded piece. The colors included red, buff and green and indicate the presence of a rather elaborate facade. The disarticulated and buried nature of the facade is reminiscent of the ritual events of Structure 5C 1st.

Level six consisted of a friable greyish brown loam intruded by cobble size rubble fill. It was approximately 60 cm. thick. Level seven was defined by a compacted white marl lens (F2) 10 cm. thick. It was underlain by a 30 cm. thick gravel size ballast layer packed in a friable off-white marl. Although the white marl

lens was not as hard as exterior flooring operations found elsewhere in the settlement, it was comparable to the interior floors of some of the structures (Structures 11B and 10C). The tightly packed gravel size hearting supporting the lens further suggests that this was an interior floor associated with the initial platform construction at this location.

Level eight was a polished hard plaster floor (F3), together with its underlying tightly packed hearting. This floor (F3) was 10-15 cm. thick and supported by a thin underflooring event of friable white marl. The gravel hearting was 15 cm. thick and underlain by 30 cm. of cobble size ballast. A sealed Tulix phase date was obtained from the ceramic fill. This flooring operation is understood to be an extremely well preserved section of the original subplaza Structure 9A.

Level nine represents the brown grey clay paleosol underlying the site. A thin discontinuous lens of white marl capped the paleosol and may represent a preparatory surface laid down for the plaza construction. A ceramic inventory from the upper reaches of the paleosol was much larger than expected and dates to the Co'h phase exclusively. This artifactual debris may be associated with an earlier ground level occupation prior to the plaza construction of Tulix times.

Structure 14 is understood to be a Tulix phase non-residential structure mantled by a Classic and Postclassic reoccupation. However, a smaller platform resting upon the underlying subplaza Structure 9A is suggested. This latter structure was stratigraphically constructed in the early Tulix phase. The plaza appears to be contemporaneous with the small platform. The earliest evidence for occupation of this locus is from the paleosol surface underlying the plaza and dating to the Co'h phase.

Structure 19

This Type 3 structure group rests in a well-drained huamil setting near the western margin of the core site area. A depressed zacatal setting lies in proximity. The structure group was selected for excavation because of its imposing size and unique form. This structure group has been more severely damaged than any other structures in the settlement. Bulldozer action has removed the southern third of range Structure 19C and perhaps disturbed the adjacent southern portion of plaza Structure 19A. Informants participating in this damage relate that the fill removed from Structure 19C was used to infill a portion of the western segment of the main canal. The size and elaborate form of the structure group suggest that this mound was a non-residential facility. The large platform area of Structure 19B may

indicate a storage facility of some kind. Our excavations demonstrate an early Tulix phase date from sealed construction fill, though a Classic and Postclassic reoccupation are indicated. (See Fig. 56.)

Structure 19C (Operation 124)

This structure is 45 m. long, 34 m. wide and 3.5 m. high. It has a potential platform summit space of 1280 m^2 and an absolute volume of 4918 m^3. During the 1978 field season a 2 x 2 m. unit was excavated to a maximum depth of 2.95 m. The unit was located on the western slope of Structure 19B. Although architectural detail was anticipated at this location, associated trash outside the final construction retaining wall was also predicted. In addition, we anticipated isolating the construction technique of the underlying subplaza Structure 19A. The test unit was oriented to magnetic north. (See Fig. 57.)

The strata were divided into nine lots consisting of seven naturally occurring levels. The surface level was defined by a dark brown loam grading into a lighter loam matrix intruded by rubble fall. Level two represented construction ballast packed in a grey loam. The eastern portion of the unit was composed of pebble size hearting which graded laterally into large rubble fill. Level three was defined by a well made construction pen wall to the northeast and small boulder size ballast in a

friable grayish brown loam to the southwest. The latter underlay the hearting stone defined in level two. The construction pen wall was five to six courses high (1.15 m. in elevation) and oriented northwest/southeast through the northeast corner of the unit. The boulder size stones were crudely faced and slightly stepped back one above the other to contain the bulk of the platform. The wall was not sectioned because of the danger of side wall collapse.

Level four represents a compacted layer of greyish brown loam intruded by gravel size ballast. This 15 cm. lens appears to be a foundation deposit over which the large ballast was laid. Level five consisted of a 5-7 cm. soft plaster floor (F1) and an underlying 20 cm. thick gravel size hearting support lens. This floor (F1) was found to underlie the construction pen wall and is understood to be the subplaza surface Structure 19A. Level six consisted of a thin lens of white marl "preparatory surface" underlying the plaza consruction. It in turn overlay a 20 cm. thick deposit of brown silty loam containing a sizeable quantity of Tulix phase ceramics. This latter deposit may indicate the presence of a ground level Tulix phase dwelling in proximity to our exposure, but the inventory was not dense enough to argue for primary midden deposition. In the southwest corner of the unit at 238 cm. BSD, we isolated a Tulix phase "beer

mug" (Matamore Dichrome; Matamore Variety) cached and sealed below the plaza floor (F1). The pot was placed in a cavity fashioned from dry-laid ballast and dark grey loam. A few other large sherds were found in association but no other complete vessels were found. The cache was not covered by a preparatory surface and would appear to date the plaza construction.

Level seven was defined as the base of the mound construction and consisted of the dark grey gumbo paleosol found elsewhere at the site. The grey decomposing parent material was less than 10 cm. thick and immediately underlain by indurated caprock. A vertical solution channel was evident in the basal matrix.

The Structure 19 Group is understood to be a Tulix phase non-residential facility. It demonstrates a single Tulix phase construction event, although a later Classic and/or Postclassic occupation is evident. There is some evidence for a domestic occupation prior to the plaza construction during early Tulix times.

Structure 16

This Type 5 structure rests at the southeast margin of the subplaza Structure 9A within a <u>huamil</u> setting but immediately north of the depressed <u>zacatal</u> near the center of the core site area. This relatively small range structure is oriented toward the center in a manner similar to that noted in Structures 13, 14, 15 and

the Structure 10 Group, all in near proximity. The mound and underlying ground level floors date to the Co'h phase. Although no features were exposed, this structure is hypothesized to be a domestic facility due to its size and the suggestion that the underlying domestic occupation resulted in a later mounded residence. Tulix phase occupation is suggested and Postclassic diagnostics indicate a substantial reoccupation. (See Fig. 58.)

Structure 16A (Operation 130)

This structure is 23 m. long, 11 m. wide and 1.0 m. high. It has a potential platform summit space of 48 m^2 and an absolute volume of 151 m^3. During the 1978 field season a 2 x 2 m. unit was excavated to a maximum depth of 170 cm. The unit was placed on the north slope of the mound in anticipation of an axial staircase and/or associated midden debris. Only the second proposition was partially fulfilled. The unit was oriented to magnetic north. (See Fig. 59.)

The strata were divided into six lots consisting of three arbitrary and three natural levels. The upper three levels were arbitrarily separated in an attempt to seriate the construction events responsible for the structure. The upper reaches of the mound consisted of a dark brown loam intruded by small boulder size fall and fill. It graded into a light brown clay loam intruded by slightly smaller rubble fill.

Level four was defined by a naturally defined 15 cm. thick white marl cap. It appears to be a "preparatory surface" underlying the mound construction. In its lower reaches it was intruded by midden debris. Level five represented a complicated sealed series of lenses associated with ground level occupation prior to mound construction. This dark brown midden deposit contained ash and charcoal debris as well as bone and shell fragments. The upper level was terminated on a lens of dark midden clay defined by a surface of horizontally bedded sherds and a possible <u>tierra quemada</u> flooring event. In addition to charcoal, bone and sherd debris on the floor, a bit of hard plaster associated with red earth stains was noted. Although this primary midden debris was quite dense, level five was only 15 cm. thick.

Level six was defined as the black gumbo paleosol underlying the site. It contained a bit of sherd debris filtering down from above. The grey parent material was found to underlie this matrix.

Structure 16 is a Co'h phase domestic facility at the margin of subplaza Structure 9A. Structure 9A appears to be a Tulix phase construction which did not directly encompass Structure 16. The underlying ground level structure would appear to be contemporaneous with the Feature 33 exposure (Operation 107) underlying subplaza Structure 9A and only slightly earlier than the

postulated Tulix phase ground level occupations under Structures 13 and 14. It should be noted that the floors exposed under Structure 16 appear identical to those defined under subplaza Structure 2A of the central precinct which in part date to the Co'h phase.

Structure 15

This Type 4 structure rests to the immediate northeast of Structure 16 within a well drained huamil setting. The mound lies at the immediate southeast margin of subplaza Structure 9A. The major intrasite zacatal depression lies to the south. The mound is oriented toward the central precinct in keeping with the other mounds resting on subplaza Structure 9A. The structure dates to the Co'h phase and is underlain by the same type of midden debris exposed under Structure 16. The mound is believed to be a residential facility due to its size. The underlying midden deposit further argues for functional continuity through time and space. Tulix phase occupation is indicated, but later Classic and Postclassic reoccupation appears more substantial. (See Fig. 58.)

Structure 15A (Operation 131)

This structure is 42 m. long, 39 m. wide and 1.7 m. high. It has a potential summit floor space of 96 m^2 and an absolute volume of 1474 m^3. During the 1978

field season, a 2 x 2 m. unit was excavated to a maximum depth of 2.4 m. The unit was placed on the southwest portion of the structure to reveal architectural detail as well as potential midden debris. Neither expectation was realized in association with the final construction phase. The unit was oriented to magnetic north. (See Fig. 60.)

The strata were lotted into four naturally occurring levels. The surface level was defined by a dark brown loam intruded by fall stone. A layer of flat bedded cobble size stones covering the entire unit was defined at the base of the level. This appears to be a Postclassic modification of the original Co'h phase mound. Level two was defined as a light tan silty loam intruded by rubble fill. The limestone cap was removed and found to be underlain by an ephemeral lens of white marl which graded into the rubble fill. Level three consisted of a white marl matrix intruded by very few stones. At the base of this matrix a single course of small boulder size foundation stones were found to cover the entire unit.

Level four represented a primary midden deposit underlying the mound construction. Although no clear flooring event could be isolated, a red stain was apparent in a discontinuous distribution across the unit. The dark midden clay contained charcoal, ash, bone and ceramic

debris. The dark brown gumbo paleosol was identified immediately below the midden clays. It was post hole probed and found to be 30+ cm. thick and underlain by the ubiquitous grey parent material.

Structure 15 is viewed as a Co'h phase house mound associated with Structure 16. They antedate sub-plaza Structure 9A, although Tulix phase occupation is suggested. The underlying midden deposit is similar to that identified under Structure 16. It is postulated to be associated with a ground level occupation similar to Feature 33 (Operation 107) and that underlying Structure 16. It should be noted that the ground level occupation underlying subplaza Structure 9A appears to be more dispersed than the nucleated village defined under subplaza Structure 2A.

Structure 29

Structure 29 rests in elevated huamil in the southeast portion of the cove site area. Its spatial relationship to the two ballcourt groups (Structure Groups 61 and 50) is unique in that its western medial axis bisects a north/south trending line between the two courts. It might be added that this same north/south line continues through the alleyway between Structure 4 and Structure 6 of the central precinct and appears to define a midline bisecting the intrasite area. Structure 29B is a prominent Tulix phase civic monument

which will be treated in another presentation. However, the subplaza Structure 29A oriented to the west is the subject of this narrative. This plaza area dates to the Tulix phase. It was selected for excavation because of the possibility that an extensive stratigraphic column for the settlement zone would be present. Additionally, architectural detail was anticipated. Only a bit of the latter expectation was realized. An ephemeral Postclassic reuse of the platform was also indicated. (See Fig. 61.)

Structure 29A (Operation 134)

This structure is 100 m. long, 80 m. wide and 1.5 m. high. It has a potential floor space of 8000 m^2 and an absolute volume of 12,000 m^3. During the 1978 field season a 2 x 2 m. unit was excavated to a maximum depth of 2.15 m. The unit was placed at the foot of Structure 29B on the medial axis of the structure. It was oriented to magnetic north. (See Fig. 62.)

The strata were divided into seven lots consisting of three arbitrary and four naturally occurring levels. The surface level was defined as a dark brown A-horizon clay loam intruded by limestone fall as well as an apparent Postclassic earthen mantle. Level two represented the definition and removal of a well defined hard plaster floor which sealed the remainder of plaza fill. The floor (F1) was 5-9 cm. thick and underlain by a comparable thickness of pebble size hearting. The southern portion

of the floor was less well preserved than the northern three-quarters of the unit.

Levels three, four, five and six were artifically leveled lots and can be viewed as one naturally occurring level. These levels were separated to maintain stratigraphic control throughout the unit. The 130 cm. of fill underlying the plaster floor and support hearting consisted of thick discontinuous lenses of dense white sascab alternating with light brown clay loam mottled by the sascab fill. In the upper reaches of the deposit, isolated pockets of dark brown loam containing burnt limestone gravels intruded the sascab matrix. In the lower reaches of the exposure, thin lenses of black granular soil mottled the sascab. Very few stones intruded the plaza fill. However, along the western excavation wall, a well constructed 4-5 course high wall (130 cm. in elevation) retained the earthen plaza fill. This construction wall is probably a construction pen wall similar to those defined in the central precinct.

Level seven was defined as the dark brown paleosol found under most of the structures in the settlement. Although a few sherds were found in association with the matrix, they are understood to be a consequence of vertical migration. The paleosol was 10 cm. thick and underlain by a yellow granular parent material.

Plaza Structure 29A was constructed as one event during the Tulix phase. The absence of stone fill for this structure may be a consequence of its low massive form requiring less rigidity than taller structures. Even so, it is considered anomolous when compared to other structures of similar form at the site. It is suggested that the fill for Structure 29A came from the depressed thornbush and zacatal setting to the west. Once the maximum quantity of stone from throughout the settlement was removed, further excavation is postulated to have occurred into the sascab parent matrix which underlies the caprock. The depressed condition of the zacatal is understood to be a consequence of this subplaza Structure 29A.

Structure 21

This Type 4 structure rests in a fork of the main canal at the northwest edge of the core site area, 30 m. south of the bay. It is surrounded by zacatal and hulub, but occupies an island of well drained caprock. A tentative Tulix phase date has been assigned to this structure, although the ceramic inventory was very small. Given the imposing size and position of this mound at the entrance of the canal system, this structure is suggested to have functioned as a non-residential facility. (See Fig. 54.)

Structure 21A (Operation 105)

This structure is 32 m. long, 25 m. wide and 5.0 m. high. It has a potential summit floor space of 70 m^2 and an absolute volume of 2175 m^3. During the 1976 field season, two 1 x 2 m. units were excavated at the summit and on the western flank of the mound to a depth of 180 cm. and 170 cm., respectively. These unit locations were selected to obtain sealed construction fill dating samples as well as possible architectural detail. Both units were oriented to magnetic north. (See Fig. 63.)

The summit exposure was divided into six lots consisting of five natural levels. The first two levels consisted of a humic horizon underlain by a grey marl matrix intruded by pebble to small boulder size rubble. Level three consisted of a friable light grey clay containing bits of pottery, charcoal flecks, ash and sascab.

At 70 cm. BSD, level four was defined as white marl/sascab containing abundant charcoal flecks, fire-cracked limestone and ash. Although the exposure was limited, this 10-15 cm. thick lens may be the remains of an early house floor. Level five was a mottled light grey marl immediately underlying the sascab lens. No hearting ballast was noted and only boulder size rubble comprised the mound fill. A thin discontinouous lens of dark friable clay appeared in the unit at 170 cm. BSD and it may represent a construction pause.

The western flank exposure consisted of four lots excavated from three naturally defined levels. The surface level consisted of humic loam and gravel size stone. Level two was composed of cobble size ballast in a grey marl matrix. These stones were underlain by small boulder size rubble. Level three was defined by boulder size rubble containing little soil matrix. This appears to be the dry-laid core of the mound.

Structure 21 provided little architectural or functional evidence from our limited test excavations. The Tulix phase date is derived from a construction fill context.

Structure 22

This Type 6 mound structure is located 40 m. south of the present bay in the northwest portion of the core site area. The mound is located in well drained huamil, but flanked to the west by zacatal. The structure has been assigned a Late Postclassic date, though a mixed Late Preclassic sample was also collected. The mound appears to have been a small domestic unit. (See Fig. 45.)

Structure 22A (Operation 106)

This structure is 12 m. long, 9 m. wide and 0.5 m. high. It has a potential summit floor space of 16 m^2 and an absolute volume of 31 m^3. During the 1976

season, a 2 x 8 m. trench was excavated up the south side of the mound to a maximum depth of 1.0 m. Both midden debris and architectural detail were anticipated, but neither were realized. An attempt was made to strip the exposure and at the same time maintain a 2 x 2 m. provenience control. (See Fig. 64.)

Four arbitrary levels were defined during excavation. Levels one and two were defined by the dark humic loam underlain by a light brown clay. Levels three and four consisted of a light brown clay intruded by cobble size rubble fill. The entire exposure was mottled by vertical intrusions making the dating of the structure suspect. The ceramic inventory consisted of a Postclassic/Preclassic mix.

Structure 22 is a poorly understood structure, in spite of a sizeable excavation area. It has been tentatively assigned a Late Postclassic date and perhaps a residential function. A Tulix phase occupation is also suggested.

Structure 18

This Type 5 structure rests in the western portion of the core site area. It lies in the northwestern margin of the largely depressed thornbush and zacatal zone at the center of the site. This structure is positioned in a less well drained huamil setting. The mound has been assigned a Late Postclassic date, although a

Preclassic ceramic inventory is apparent. The structure appears to be a small residential locus. (See Fig. 45.)

Structure 18A (Operation 11)

This structure is 15 m. long, 12 m. wide and 0.8 m. high. It has a potential summit floor space of 80 m^2 and an absolute volume of 130 m^3. During the 1974 field season a 2 x 2.5 m. unit was excavated to a maximum depth of 1.70 m. The long axis of the exposure was oriented east/west. The unit was placed at the summit of the structure to obtain a sealed construction fill date. (See Fig. 65.)

The five natural strata were divided into ten arbitrarily defined levels. The surface humus was underlain by cobble size flat laid rubble encased in a dark brown clay loam. A burial was found 40-60 cm. BSD within this matrix (B6). This poorly preserved adult was lying on its left side in a semi-flexed position with its head oriented to the west. Although no accompanying furniture was found, a notched chert point was located near the area of the groin.

The next natural stratum laying at 120 cm. BSD consisted of a black clay loam intruded by gravel size stone. A high sherd concentration was associated with this 20 cm. thick lens. It may define an earlier ground level occupation. A viscous grey clay paleosol intruded by cobble size and smaller limestone chunks underlay the

black clay loam. It in turn was underlain by sterile white decomposing caprock.

This structure is understood to be a Late Postclassic manifestation, although an earlier Tulix phase ground level structure may be suggested. A residential facility is implied.

Structure 102

This Type 5 structure lies in the western portion of the site, 180 m. outside the main canal and 90 m. south of the bay. The setting is a well drained huamil. The mound was selected for excavation to increase our structure sample from the western portion of the site. A tentative Early Classic date has been assigned to this feature, although an earlier ground level occupation is possible. The structure appears to have been a domestic facility. (See Fig. 43.)

Structure 102A (Operation 142)

This structure is 20 m. long, 14 m. wide and 0.5 m. high. It has a potential platform summit space of 36 m^2 and an absolute volume of 79 m^3. During the 1978 field season a 2 x 2 m. unit excavated to a maximum depth of 1.20 cm. was placed on the northeastern flank of the mound. The unit was positioned in anticipation of architectural detail and/or midden debris. Neither expectation

was realized. The unit was oriented to magnetic north. (See Fig. 66.)

Four natural levels were defined and controlled. The surface level was identified as the dark brown humic loam intruded by eroding fall debris. Level two consisted of a tan silt loam intruded by boulder size limestone rubble fill. This matrix comprised the bulk of the mound core. Level three was defined as a 20 cm. thick black loam trash deposit. It was located 80 cm. BSD and restricted to the western half of the unit. Sherds, lithic debris and charcoal were collected. This deposit may be associated with a ground level structure given its location under the bulk of the mound.

Level four was defined as the underlying dark clay gumbo paleosol. It rested upon the decomposing yellow granular caprock. The caprock appears to undulate slightly across the unit.

Structure 102 is considered an Early Classic construction. It appears to be part of the postulated Early Classic occupation at the western end of the settlement. The structure has been tentatively identified as a house mound.

Structure 98

This Type 4 structure rests in a <u>huamil</u> setting in the southwestern margin of the core site area. It lies 10 m. north of the main canal. The structure was

selected for investigation because of its small size and commanding position at the bank of the canal. The structure has been assigned a Tulix phase date and appears to be a residential facility. (See Fig. 67.)

Structure 98A (Operation 141)

This structure is 24 m. long, 19 m. wide and 1.5 m. high. It has a potential summit floor space of 160 m^2 and an absolute volume of 462 m^3. During the 1978 field season a 2 x 2 m. unit was placed on the southwestern flank of the mound and excavated to a maximum depth of 130 cm. The unit was oriented to magnetic north. Architectural detail and midden debris were anticipated but only the latter expectation was realized. (See Fig. 68.)

The strata were divided into three levels consisting of four lots. The surface level was defined by a dark brown loam humus heavily intruded by pebble size and smaller limestone ballast. No platform flooring was preserved. Level two consisted of boulder size and smaller rubble fill packed in a moist compacted grey clay. The bulk of the limestone was severely weathered and appears to have been waterlogged. A high $CaCO_3$ salt concentration was distributed throughout the exposure. The level was terminated upon uncovering a complete Tulix phase vessel (Cabro Red: Variety Unspecified) resting in the southwestern quadrant of the unit. Although the

water table does rise seasonally and may inundate a major portion of this mound, the fill associated with this level is unlike most other mound excavations with the exception of Structure 38. However, the fill removed from the canal and adjacent caprock appears very similar (Operations 116, 151, 152 and 153).

Level three consisted of the same moist, compacted grey clay as defined in level two, but unintruded by rubble fill. It was excavated in two lots to maintain provenience control. The southwestern three-quarters of the unit contained a high frequency of midden-like debris. Large sherds, bone, charcoal, ash and fire-cracked rock were collected. Some fragments of human bone were apparent. In the southwest corner of the unit, the concentration of debris was the most dense. This debris may correspond with the position of an outside platform retaining wall, as a few crudely dressed stones were noted in this area. The decomposing yellow granular caprock defined the bottom of the exposure.

Structure 98 is a Tulix phase mound. Given its proximity to the canal and the nature of its fill, it is argued that it was constructed from a dredging event in the canal's prehistory. Some of the larger limestone rubble may have been removed from the banks of the canal in an effort to widen or deepen it during the Tulix phase. The canal has been demonstrated to date to the

Co'h phase. Given that the canal sediment fill type comprises the bulk of the mound fill, Structure 98 would appear to represent a later dredging episode as well as an occupation facility.

CHAPTER V

LATE PRECLASSIC BALLCOURTS AT CERROS

The competitive rubber ball game played in a masonry court has long been considered a characteristic feature of Mesoamerica, with a probable origin within the rubber producing lowlands (Stern 1949:4). Although the wide distribution of related ball games suggests an origin and dissemination during the Preclassic period (Kemmer 1968:15-16; Kubler 1975:41; Stern 1949:76), the masonry ballcourts which have been excavated and reported in the Maya Lowlands to date are associated with the Classic and Postclassic periods.

Two ballcourts have been excavated in the settlement at Cerros. These single major construction phase courts are morphologically more similar to one another than to other known ballcourts, although formal analogies to other courts can be drawn. Evidence suggests that these courts are two of the earliest ballcourts in the lowlands, further suggesting that the eastward diffusion of the ballcourt "theme" out of the Veracruz-Tabasco area was a more dynamic process than commonly presumed.

Intrasite Relationships

Structure Groups 50 and 61 are believed to be contemporaneous and built during the Tulix phase. Both courts are oriented north/south and appear to lie on a geographic north/south medial axis bisecting the site as defined by the canal perimeter and the pyramidal Structure 5C of the centrally located ceremonial precinct. In addition, the westward orientation of Structure 29 and its associated plaza axis appear to intersect the medial site axis at a point equidistant from either ballcourt area. (See Fig. 13.) Although the areas in immediate proximity to the courts were well drained, the location midway between the two structure groups is believed to have been a catchment reservoir. This supports the idea that much of the settlement was planned and constructed during one moment in time, although the architectural and/or astronomical import of this spatial design is poorly understood.

The playing alley of Structure 61 group lies approximately 200 m. N5°W of Structure 50 group and approximately 100 m. N170°W of the medial staircase of Structure 3. Structure 61 group is composed of two parallel ranges; Structure 61B to the west and Structure 61C to the east. No well defined north/south boundary could be demonstrated for the group, although the raised alley appears to have dropped away at the same

north and south location as the structures themselves. The playing alley is labelled Structural feature 61A.

Structure 50 group consists of four range structures, labelled clockwise 50B through 50E with the southern most range flanking the canal bank. The central plaza and playing alley are labelled Structural feature 50A. The playing court is defined by the two parallel ranges, Structure 50C to the east and Structure 50E to the west. The largest mound of the group, Structure 50E, delimits the northern extent of the group. The southern basal riser of Structure 50B lies 38 m. north of the center of the alley, although a shallow plaza depression separates it from the other structures. Structure 50D is located 26 m. south of the alley center being linked to the alley by continuous raised plaza fill. It should be noted that no standing architecture has been exposed on any structure in the settlement zone at Cerros.

Excavations in the Structure 61 Group

Structural feature 61A was mapped and briefly examined in 1978 with a 2 x 2 m. test unit in the alley. Two hard plaster floors supported by limestone ballast and underlain by midden debris were located. In addition, a sizeable hole, 1.65 m. in diameter, was defined intruding through both floors. The Structure 61 group was not interpreted as a ballcourt until the 1979 season when the

original test unit was extended to form a 2 m. wide trench cross-cutting the ballcourt along the central axis with extensions to the south along the bench of Structure 61B and to the north along the bench of Structure 61C. Twenty square meters were horizontally excavated within Structural feature 61A, 22 m^2 were exposed within Structure 61B and over 51 m^2 were laterally excavated within Structure 61C. Our excavation and recovery techniques involved the excavation and screening of naturally defined levels. (See Fig. 72.)

Structures 61B and 61C are approximately 2.7 m. high in their present state of preservation. At the base, they are 22 m. north/south by 18 m. east/ west with inclined benches on their interior faces. These benches flank a narrow alley which is oriented approximately N1°E. (All directional data must be considered only as a close approximation of the original alignment due to the nature of the masonry and the effects of weathering. All bearings are referenced to true north.) The ranges may have supported perishable buildings, although no indications have been found of masonry superstructures.

The masonry of the range structures consists of coursed stones chosen for general consistency in size and shape. There were no finely dressed stones. The stones range from an average of 20-25 cm. across for the

loaf shaped stones of the benches and upper wall of Structure 61B to an average of 35-40 cm. across for the masonry of the staircase and upper wall of Structure 61C. This type of masonry is common throughout the site. The benches are constructed of horizontal courses stepped back to form a slope over a core of rubble and marl. Small, irregularly-shaped flat stones form a discontinuous layer over the stepped courses. These stones are set into a compact, light grey, mortar-like matrix which covers the stepped courses. A sloped surface to the benches was achieved when the exposure was covered with hard plaster. This same bench construction technique was employed in building the Structure 50 group ballcourt.

The alley and end zone floors are paved with well preserved hard plaster. In addition, some plaster remains on the benches and on the upper wall of the western range, Structure 61B. Although no preserved paint was found on the <u>in situ</u> plaster, two pieces of plaster which were recovered from the fall were surfaced with a deep red color. One fragment was collected near the benches of each range structure.

The sloping face of the benches angle between 20° and 30° with the alley floor (varying with the area measured). As a consequence of preservation, it is not clear whether there was a sharp angle between the face and the top of the bench or a more gradual transition

between the two surfaces. The small patch of flooring at the top of the benches shows a very slight batter (2° or less). These surfaces average 1.02 m. above the alley floor in Structure 61C and 1.06 m. in Structure 61B. The width of the bench tops is approximately 2.5 m.

The upper or playing walls of the two ranges differ somewhat. In addition to the larger stone masonry used in the upper wall of Structure 61C, its angle (81° from the horizontal as measured on the masonry) is quite different from that of the upper wall of Structure 61B (36° as measured on the plaster). Time did not allow us to trench through the upper walls; it may be that the exposed wall of one of the ranges is a later addition which was never constructed on the other structure or simply was not preserved.

The east/west trench which revealed these walls extended down the backside of Structure 61C. A staircase was exposed with a central landing and a small patch of flooring located at the foot of the lowest riser. The trench did not reveal the north or south edges of the presumed outset staircase (by analogy to Structures 50C and 50E).

The form of the range corners is not clear. Preservation worsens toward the corners of the benches. As far as can be determined, they formed fairly sharp angles, perhaps with some slight rounding. Limitations

of time precluded widening the trenches to determine the appearance of the corners of the upper walls.

Structure 61 group is an open-ended ballcourt. The full extent of the plaster flooring in the end zones has not been determined. Further excavation may reveal some type of boundary around the end zones, such as a line of stones (Stern 1949:36). However, there are no obvious walls or platforms defining the end zone boundaries. The playing area boundaries may be roughly marked at the ends of the upper alley floor surface (Floor IA). This floor ends in an irregular line near each bench corner with the underlying floor (Floor IB) continuing beyond it. This is analogous to the latest building phase in the Structure 50 group.

No marker stones or niches were found in the exposed parts of this ballcourt. However, the initial test unit excavated during the 1978 field season revealed a circular depression in the alley floor. This hole contained a fill of pebble size limestone in a marl matrix. It is 1.65 m. in diameter and 1.0 m. in depth. This fill is distinct from the surrounding platform fill. The purpose of this pit is not clear, although similar depressions were exposed in the alley floor of the Structure 50 group. This may suggest a connection between these features and the function of the structures

as ballcourts. On this basis it may be suggested that this was the location of an alley marker of the type common in the Maya Lowlands (Blom 1932:4; Satherthwaite 1933:1; Kubler 1975:133) which was removed at the time of abandonment. This ritual abandonment of the ballcourt would have been equivalent to the ceremonial defacing of buildings in other Late Preclassic contexts at Cerros. It should be noted that the pit was not located on either central axis of the ballcourt but was centered 1 m. south and 75 cm. east of the midpoint of the court. This noncentral location is a feature shared with the depressions in the alley of the Structure 50 group.

One feature on top of the bench of Structure 61B may indicate the position of another ballcourt marker. The plaster on top of the bench was sectioned at a curiously high spot. A post hole-like feature approximately 20 cm. in diameter and 10 cm. in depth was found filled with the white plaster of the overlying floor. The surrounding matrix was a light grey clay loam which may represent an earlier destroyed flooring event. The hole appears to have been associated with this earlier surface. If the hole held a tenoned marker, it has been removed and filled with plaster in the process of laying down the later floor. This feature is south of the medial axis, but it is on an east/west line with the approximate center of the hole in the alley.

Construction Sequence

The 1978 testing operation was geared specifically to determining the stratigraphic sequence and the ceramic inventory of the Structure 61 group. The excavation unit was taken down to sterile soil. The 1979 operation concentrated on exposing as much of the ballcourt as time permitted in order to obtain information on its form and dimensions. However, the area of the playing alley within the 2 m. wide east/west trench was excavated to within 25 cm. of the sterile paleosol. Also, the 2 x 4 m. unit at the rear of Structure 61C was excavated below the floor level and the lower four risers of the staircase were removed. Finally, a 50 cm. wide test trench was excavated through the bench of Structure 61C.

The construction sequence in the alley is the most complete and will be discussed initially. (See Fig. 73.) The first cultural deposit above the basal sterile black gumbo paleosol is a 3 cm. thick white marl lens designated Floor III. This was evidently laid down as a foundation for all further construction; a common technique at Cerros. This layer was exposed only in the initial test unit 90 cm. below the alley floor (Floor IA). Immediately overlying this lens is a dark grey midden layer 12 cm. thick. Although it is uncertain whether this is a primary midden deposit associated with a house or a secondary deposit brought in as fill, there is

evidence for ground level structures during the Co'h phase and possibly the Tulix phase elsewhere in the settlement (Freidel and Scarborough n.d.). Overlying this midden is a patchy marl layer 3 cm. thick (Floor II).

The next level clearly constitutes platform fill. It consists of one to two layers of cobble size rubble set in a thin discontinuous reddish-brown soil, overlain by pebble size dry-laid floor ballast. This level is 50-60 cm. thick.

Overlying this fill is a 6-10 cm. thick layer of hard plaster (Floor IB). This floor extends to the edges of our two north/south trench exposures and underlies Structure 61C at least as far east as the upper playing wall. A small patch of flooring in front of the Structure 61C staircase (Floor IV) was found at the same level as Floor IB. However, at this same elevation under the staircase itself no flooring was found; only a marl construction pause. It appears that Floor IB was laid down before the benches were constructed but not as a base for the entire structure. A logical expectation would be that the ranges were built, then Floor IB was laid, and finally the benches were added. Further support for this expectation is indicated by the wear pattern on the floor. Floor IB is quite worn and pitted in the alley area but smooth and unworn under the bench. It should be noted that our trench into the bench of

Structure 61C revealed only rubble fill under the upper playing wall, with no indication that this wall extended down to the level of Floor IB.

Overlying Floor IB in the alley is a 1 cm. deep lens of grey marl. Immediately above this marl is another hard plaster floor (Floor IA). This floor extends laterally to the edges of the bench masonry. Floor IA consists of plaster only, without gravel ballast.

The plaster lip extending up onto each bench was added after Floor IA was laid down. These plaster wings extended out 30 cm. from the bench masonry and provided the surficial face of the bench batter. A small test on a well preserved part of the bench of Structure 61B demonstrated that there were two layers of plaster on the bench face, both associated with Floor IA.

One feature of Floor IB suggests that at one time there was a plaster bench surface associated with this floor. In front of both benches there is a straight strip of well preserved flooring, like that under the bench of Structure 61C before the worn appearance of Floor IB begins in the alley. This strip corresponds closely to the extent of the plaster lip associated with Floor IA. While it is possible that the very edge of the floor received less abuse than the center of the court during the course of play, the clarity of the line between worn and well preserved plaster suggests that the floor

was protected by some type of surface beginning at this line. It is argued that the plaster lip was removed at the time the new alley floor (Floor IA) was added. Apparently the benches could not be replastered without narrowing the alley, suggesting a degree of standardization for the width of the court. However, the possibility of ritual defacement of plaster surfaces associated with the renovation of the alleyway might be kept in mind as a viable alternative explanation.

Although the 1978 test unit yielded a good number of exclusively Late Preclassic sherds, the sealed sample recovered from the alley in 1979 was disappointingly small. In order to enlarge the sample, a trench was opened through the staircase of Structure 61C. The removal of the staircase and underlying rubble fill revealed the marl construction pause previously mentioned. In addition, a north/south trenching wall (Wall C) was found resting on this marl pause just underlying the middle of the staircase landing. The rough masonry of this wall suggests that it is a construction pen wall employed to hang the lower outset portion of the staircase. Construction pens using walls of large, rough stones are a common feature of construction at Cerros (see Structure 50B). Wall C was not removed because it corresponded closely to the western line of our 2 x 4 m. unit. Below the marl pause associated with this

construction wall was a pebble size ballast similar to that underlying Floor IB in the alley. It was less tighly packed and set in a matrix of buff marly soil. This layer was 40-50 cm. deep, terminating upon the exposure of a yet earlier marl construction pause. This pause corresponds in depth to the marl lens designated Floor II in the alley. Apparently associated with this pause was another construction wall (Wall D) running in an east/west direction from the line of Wall C and continuing at least as far as the edge of our trench. This crude wall was only two courses high and was immediately overlain by the upper marl pause.

Floor II evidently formed a base for the entire construction. Upon this foundation, the structures were built of a wet-laid fill retained by construction pen walls in the east and a more dry-laid fill in the west. The exact line between these two types of construction and the reason for the difference can only be determined through further excavation.

Excavations in the Structure 50 Group

Structures 50C and 50E and Structural Feature 50A

The Structure 50 group was initially located, mapped and briefly tested during the 1978 field season. At that time a 2 x 3 m. test unit was excavated at the northwest corner of Structure 50E. Two walls were

revealed in this unit. Wall A was constructed of two courses of finely cut block masonry oriented N95°W. Wall B was constructed of vertically set slabs and faced away from Wall A. It appeared to be part of a later building event. A hard plaster floor found on the north side of Wall A covered the lowest course of this wall. Ceramics sealed by the floor were found to date exclusively to the Late Preclassic period.

Structures 50C and 50E as well as plaza Structural feature 50A were extensively excavated during the 1979 field season. The excavations carried out on Structure 50E exposed 42 m^2 on its western flank, 45 m^2 on its nothern side, 26 m^2 on the playing bench and a two m. wide medial axis trench across the structure. More than 113 m^2 of lateral exposure were excavated. Structure 50C exposed 38 m^2 on its eastern side with a 6 m^2 extension at the northeast corner and an 8 m^2 exposure on the bench. Fifty-two m^2 were horizontally excavated on this structure. A total of 68 m^2 of the playing area were revealed. As was the case with the Structure 61 group, our recovery techniques involved the excavation and screening of naturally defined levels. (See Figs. 69 and 71.)

Structures 50C and 50E are argued to be symmetrical rectangular ranges. Each is preserved to a height

of 2.1 m. The alley separating the two structures is 4.2 m. wide and oriented N4°E. The structures consist of three step terraced platforms with the basal terraces measuring 18 m. north/south by 14.5 m. east/west.

The basal terraces consist of sloping benches facing onto a playing alley. The benches are 1.1 m. high with a batter of 50°. The tops of each bench are poorly preserved except for a small area of plaster flooring associated with Structure 50C. It remains unclear whether these surfaces were level or canted. On the backside of Structure 50E, the terrace steps down 30 cm. to the associated exterior plaster floor. The back and side wall corners are inset with apron moldings. Several fragments of painted and molded plaster were located in the fall behind Structure 50C, suggesting that facading decorated the back sides of these structures. Unfortunately, the precise location of this plaster decoration is unknown as no in situ plaster was exposed. The fragments show elements similar to those found from the facades flanking the monumental architecture elsewhere at Cerros (Structures 5C and 29B; Freidel 1977a, 1979, n.d.).

The playing walls facing the alley were located on the second terraces. They are inclined at an angle at 70°, and are 50 cm. high and recessed 3 m. behind

the bench faces. The terraces are T-shaped in plan with a broad staircase, 4.6 m. wide, extending off the backside of each structure. The staircases are outset 1 m. from the back walls of the structures. Fragments of six risers were found behind Structure 50E. Only the lower steps were preserved on Structure 50C.

The uppermost terraces on both structures appear to have been small rectangular platforms probably supporting perishable superstructures. These terraces were recessed 2 m. behind the upper courses of the playing walls. The playing wall and the alley side wall of the upper terrace were found in good condition on Structure 50C, although neither were preserved on Structure 50E. The upper wall on Structure 50C was inclined like the playing wall (60°) and preserved to a height of 50 cm. None of the upper platform side walls were exposed, so the north/south length of these platforms is uncertain. The back walls of the platforms were identified on both structures, providing an east/west width of 4 m. for the platforms. A fragmentary wall oriented at a right angle to the back wall on Structure 50E may have formed part of a bench on top of this upper platform. The poorly preserved nature of this wall prevented a definite identification and a similar feature could not be located on Structure 50C.

Several types of masonry were used in the construction of Structures 50C and 50E. Finely cut limestone blocks were used in the construction of the back and side walls of the lowest terraces and on the staircases. The blocks used in Structure 50C are smaller than those in Structure 50E. Those in the Structure 50C construction average 10 cm. high by 15 cm. long as compared to the 15 cm. by 25 cm. blocks in Structure 50E. The staircase steps are constructed of a mixture of block sizes, ranging from small blocks 10 by 15 cm. to blocks 25 by 50 cm. In addition, a number of the large finely shaped blocks were recovered from the fall around the backs and sides of the structures. Since these stones were not found _in situ_, except on the staircase, their original location cannot be determined. This fine block masonry is unusual at Cerros where most of the masonry is constructed of loaf-shaped stones. Although this may suggest that the Structure 50 group was built later than other structures at Cerros, the masonry in Structures 50B and 50D (which are contemporaneous with Structures 50C and 50E on the grounds of spatial orientation and ceramic inventory) contain poorly dressed stones. Apparently several types of masonry were incorporated simultaneously. The playing walls and upper terrace walls were constructed of fairly small, irregular, flat stones forming the sloping

surfaces. Loaf-shaped stones were also used in the stepped support walls found under the bench faces.

The bench faces were built of a layer of hard plaster overlying a core of marl and small ballast, as was the case with the Structure 61 group. This core was, in turn, supported by a stepped wall. The bench construction was slightly different from the Structure 61 group, where a layer of small irregularly shaped, flat stones were found between the core and the plaster surface. The bench face on Structure 50E was preserved to a height of 35 cm. above the alley floor. Only a small patch of the plaster bench face remained on Structure 50C. The original height of the bench has been estimated from the elevation of the underlying stepped support wall and from a section of plaster floor resting on top of the bench on Structure 50C. It was 1.1 m. high. The preserved section of the plaster on Structure 50E forms a 50° angle with the alley floor. This angle is more steep than the 20-30° angle recorded for the Structure 61 group. However, the stepped support wall underlying the bench surfaces of Structures 50C and 50E forms an angle of approximately 30°.

As in the Structure 61 group, there was poor preservation of the bench faces at the corners of the structures. However, the southeast corner of Structure 50E provides some information on the appearance

of the corner. Although the plaster of the bench face was not preserved in this area, the stepped support wall was in fairly good condition. This wall formed a rounded corner back to the west for approximately 1 m. Time limitations prevented further excavation of the southern wall of the structure. Through analogy with the northern wall which was almost completely excavated, it appears that within 2 m. of the corner, the stepped support wall of the bench met the vertical retaining wall of the platform. The corner and bench face may have been slightly outset from the side wall.

The Structure 50 group is an open ended ballcourt in its final construction phase. No definite boundary to the alley was found, although excavations extended 3 m. beyond the southern edge of the bench. The hard plaster floor of the alley is preserved for 2 m. south of the bench and the floor ballast extends to the edge of the excavation unit. The elevation of the alley floor surface is within 10 cm. of the elevation of the hard plaster plaza floors in front of Structures 50B and 50D, as well as those behind Structures 50C and 50E. The playing limits of the court may have been marked by paint or in some other manner which has not been preserved.

During the initial construction phase, the Structure 50 group ballcourt was identical to the final court with the exception of a sunken alley. Sections

through the alley, the plaza on the north side of Structure 50E and through the staircase of Structure 50B demonstrate that the structures were not modified when the playing court was raised. In the initial construction phase, the alley was 30 cm. lower than the surrounding plaza. This lower alley was bounded at its southern edge by a sloping plaster surface which graded into the plaza. The boundary would have extended across the alley forming a playing court 18 m. long. The boundary rises at a 35° angle from the lower alley floor (Floor IB). A section through these surfaces showed that they were constructed of a hard plaster layer supported by a marl and pebble size ballast core. No boulder or cobble size ballast stones were found. Prior to the excavation through the upper alley floor (Floor IA), the location of the boundary was suggested by an irregular break at the southern end of the alley floor. Floor IA had separated from the plaza floor and was slightly higher along the break. Floor IA was constructed without disturbing the lower sloping boundary surface. However, the bench face of this earlier court was removed before Floor IA was constructed. Only one small plaster fragment of this first bench remained <u>in situ</u> on the stepped support wall of Structure 50E. The second bench face was constructed at the edge of Floor IA. It simply involved the resurfacing the underlying stepped support wall.

No stone or plaster markers were found in the Structure 50 group. As in the Structure 61 group, large holes were found in the playing alley. The first hole excavated is on the medial axis of the alley and set 1 m. closer to Structure 50C than to Structure 50E. A second hold is located 3.5 m. south of the edge of the first and again closer to Structure 50C. The holes are oval in shape and measure 1.5 m. east/west by 1 m. north/south. Both of these holes are associated with the later court. Apparently, markers were located in these holes. Floor IB was preserved under these pits, but earlier holes were found associated with this alley. The later marker locations had shifted slightly when the alley was raised. The holes through Floor IA are southeast of those in Floor IB. The northern part of the alley was not excavated so it is unknown whether a third marker was located in that area. The markers were apparently removed as part of the ritual abandonment of the site. No post holes were found on either of the bench tops. However, on Structure 50C a small, roughly circular area of raised plaster was found in front of the playing wall. This is north of the medial axis and it cannot definitely be identified as a marker.

Construction Sequence

The construction sequence of Structures 50C and 50E was determined by excavations through the playing

alley and plaza at the southeast corner of Structure 50E, a section through the staircase of Structure 50E and the test unit excavated in 1978. As discussed earlier, the structures defining the court were constructed in one phase. The only later modification to the court was the raising of the playing alley. (See Fig. 70.)

A layer of black silty clay gumbo was found at the base of all sections through the construction. This layer is the old ground surface and has been observed in other excavations at Cerros at the base of mounds. The layer is usually sterile, although in some of the Structure 50 group sections a few sherds were found on the surface of the deposit. These were probably deposited during construction, although it is possible that the sherds are associated with some type of occupation in this part of the site predating the construction of the ballcourt.

The initial construction activity consists of a thin layer of marl laid on the paleosol surface. The marl layer is less than 2 cm. thick and like the initial construction in the Structure 61 group, it probably served as a foundation for construction.

The marl layer was covered by a layer of cobble size dry-laid ballast ranging in thickness from 15 to 25 cm. This ballast layer graded into a layer of pebble size hearting. The two ballast layers were found

underneath the structures and the plaza. The surface of the hearting layer was covered by a 2 cm. thick layer of compact gray marl in the plaza areas which was found to extend laterally for approximately 2 m. underneath the structures themselves. The lowest course of the platform walls was built on this upper marl lens as was the hard plaster surface of the first playing alley (Floor IB). The southern boundary of the first alley and the associated bench faces were built on the plaster surface of this initial alleyway. The plaza around the structures was raised with a layer of pebble size ballast in a matrix of loosely packed marl. This ballast layer was surfaced with a layer of hard plaster. The plaza floor and underlying ballast layer are 40 cm. thick.

The second construction episode consisted of raising the alley floor. The first alley floor (Floor IB) was covered with a layer of pebble size ballast packed in a marl matrix. The markers were reset in slightly different locations and the alley was covered with a layer of hard plaster (Floor IA). As in the first court, the bench faces were built on the edges of the associated plaster floor.

A final episode of construction on Structure 50E apparently postdates its use as a ballcourt. As mentioned earlier, the test unit excavated in 1978 uncovered a wall constructed of vertically set slabs (Wall B) which

postdated Wall A (part of the platform wall of the ball-court). The area to the south of Wall A was cleared and Wall B was found to be part of a square cist-like feature. The walls of this feature are constructed of vertical slabs faced toward the interior of the feature. Traces of plaster were found on the walls suggesting that they were covered with a layer of plaster. The floor of the feature was paved with a layer of flagstones set in a matrix of compact white marl. The feature appears intrusive into the construction of Structure 50E. It is 1.9 m. by 2.1 m. in plan and it is oriented at a 45° angle to the structure. The walls of the feature are 1.5 m. high. A high density of pebble size ballast in a grey loam matrix along the back and northern side of Structure 50E suggests that this area was artificially raised as part of the construction of the feature. Since this ballast layer covers a number of finely trimmed stones (which are part of the fall from Structure 50E), the feature seems to postdate the abandonment of Structure 50E as a ballcourt.

The function of this construction is unclear. In the eastern half of the feature, a large number of sherds were located, including the fragments of a complete vessel and probably most of a second vessel. They appear to date to the Late Classic period (personal communications David Pendergast and Robin Robertson-Freidel). The

arrangement of the sherds looks like a trash deposit. A concentration of cobble size stones was found in the western half of the feature. The soil matrix around the stones and sherds contained charcoal. The construction seems too elaborate to have been intended as a trash pit. It may be a looted cist burial which was used as a trash pit. Alternatively, the concentration of stones and charcoal suggest that they were used as a hearth, indicating the possibility that the feature functioned as a sweatbath. It is associated with a reuse of the Structure 50 group after the abandonment of the ballcourt.

Structures 50B and 50D

The north and south ends of the Structure 50 group are defined by Structures 50B and 50D, respectively. (See Fig. 69 and 71). Structure 50B was initially examined during the 1978 field season. A 2 x 2 m. test unit was excavated near the southcentral base of the structure. A single major construction episode was defined by a hard plaster exterior floor in association with two risers. Both risers consisted of two courses measuring 25 cm. high and composed of loaf shaped masonry. A sizeable Early Classic ceramic inventory was collected from above these features, but a pure Late Preclassic period collection was taken from under the sealed floor context. Structure 50D was not tested at this time.

Structure 50B is 34 m. long by 18 m. wide at its base and approximately 3 m. high. Eighty-nine square meters of horizontal exposure has provided information concerning the south face of the structure. More limited, although revealing, evidence for Late Preclassic architecture was gleaned from the summit and back side of the structure.

Structure 50B rests on a marl lens thought to be a preparatory surface upon which construction activities proceeded. Although this lens may represent an earlier ground level domestic structure, no associated features were discernable. The off-white marl layer is spread rather discontinuously over the original ground surface to a depth of 3 cm. The underlying black gumbo paleosol was not removed from the area.

The mass of Structure 50B was initiated and finalized in one construction phase, although minor refurbishing events did occur. The exterior of the structure is defined by a 4 m. outset staircase of which the lower two treads are well preserved and the third tread is at least traceable. The remainder of the staircase has been completely destroyed. Judging from the absence of shaped stone in the overlying fall, it is suggested that this stone was deliberately removed from the structure to another, unknown, location. The lower risers are composed of loaf shaped masonry within a marl

grout. The risers were two courses high and apparently covered with hard plaster. A fragment of _in situ_ plaster was recovered from the basal tread. The hard plaster floor lips up from the base of the structure to the lowest riser, although the floor is only well preserved within two m. of the foot of the structure. The floor appears to extend the length of the southern face of the structure and measures 10 cm. in thickness. It is underlain by 25 cm. of pebble and cobble size ballast packed in a light grey marl overlying the sterile paleosol.

At the flanks of the outset staircase are recessed panels 50 cm. high. The portion of the exposed eastern panel is composed of small loaf shaped stones. Extending 50 cm. out from the base of the panel is a 20 cm. high basal molding. The lateral extent of the panel is not known and no facading was discernable either in the fill or adhering to the wall.

At the southeast corner of the structure, we exposed a rather elaborate inset corner apparently associated with the base of the substructure only (Fig. 71). The previously defined hard plaster floor was found associated with the corner, although a later resurfacing was also revealed. It should be noted that there is an indication that basal molding was employed in the construction of this corner.

The summit of the structure received limited attention as a consequence of time restrictions and our previous experience elsewhere in the settlement in defining superstructural features. However, a surficial east/west trending wall was located. The southern face of this wall delimited the northern edge of our deep axial trench. Although the wall is thought to have been the foundation for a superstructural feature, it was also found to descend into the core of the structure. This construction pen wall, composed of small limestone boulders, appears to have cornered in our eastern profile exposing two of the four construction pen walls. This pen was 1.4 m. at its maximum height. Underlying this construction was another construction pen wall, but it was revealed in our eastern and southern trench walls. This lower construction was 1.4 m. high and filled with a dry-laid limestone pebble and small cobble ballast. The position of the lower construction pen indicates that these pens of undetermined dimensions were off-set or staggered one on top of the other presumably for additional support. Our axial trenching operation was terminated upon exposing the marl preparatory surface and the underlying sterile paleosol.

Sixty-four meters south of the foot of the outset staircase and bounding the southern end of the ballcourt lies Structure 50D. It is 34 m. east/west by 16 m.

north/south and 2.2 m. in height. One hundred twenty-five square meters were laterally exposed on the northwest face and the southeast corner of Structure 50D. A 2 m. wide axial trench provided the construction sequence for the structure.

This structure presents little evidence for a ground level dwelling underlying the bulk of the structure, although a marl preparatory surface was defined under the hard plaster floor and support ballast at the foot of the structure. This 3 cm. thick lens was laid directly on the sterile black gumbo paleosol.

Structure 50D was raised in a single construction episode. The north side or front of the substructure consists of three tiers running the length of the structure, although a lower platform extension continues beyond these substructural features at the east and west ends of the structure. A shallow step restricted to 4 m. in length was defined on the medial axis of the structure between the first and second tiers. Both the tiers and the step were three courses high. The masonry was composed of loaf shaped masonry secured in a marl grout. Immediately in front or north of the medial axis step or riser was a soft decomposing plaster cap thought to be a later refurbishing operation. A fragment of <u>in situ</u> hard plaster was found below and abutting against the base of the step.

The summit of the structure received more lateral attention than other structures in the settlement, as a consequence of locating a stone lined post hole within our axial trench. This feature is 50 cm. in diameter and defined by a flat, horizontally bedded stone at its base. A slit trench to the east exposed another stone lined post hole of similar diameter and depth located 4 m. away. Each post hole lies immediately behind an upper superstructural terrace retaining wall. The two post holes rest 2 m. east and west of the medial axis of the structure. The width and orientation of the Structure 50 group alleyway corresponds closely to the position of the post holes.

In addition, the summit appears to have accommodated a recessed rectangular platform area. Although no plaster was identified, a dense hearting stone matrix was enclosed by the single course retaining walls.

The rear or south side of Structure 50D lies approximately 20 m. from the canal (although the canal is poorly defined at this specific location). The south exposure of the structure appears to have the same tier arrangement as found on the northern face, although our excavations were quite limited. The basal foundation wall was very well preserved, having a batter of 40° and consisting of five well defined courses. A hard plaster floor was found to lip up to the bottom course. Only

Late Preclassic period ceramics were found under this floor. No preparatory surface was defined and the absence of a paleosol indicates that this area was deliberately cleaned of the humic layer in an attempt to allow passage to and from the canal before the Structure 50 group was complete. No rear staircase was defined on Structure 50D.

The southeast corner of the structure was examined in an attempt to locate midden, define the dimensions of the structure and assess the complexity of the architecture at this location. All of these objectives were attained, although the midden debris appears to be quite mixed. An elaborate inset corner was found associated with a hard plaster floor. Elevations indicate that it is the same floor defined in the front and the back of the structure. This corner is analogous to that defined on Structure 50B.

The trenching operation into the bulk of the structure was carried out in three test units positioned at both ends of the structure and at the summit. No construction pen walls were defined. The structure is composed of 70 cm. of wet-laid cobble size ballast underlain by small boulder size dry-laid rubble. The marl preparatory surface was located only under the northern basal floor exposure.

Interpretive Notes

The excavations outlined above have provided temporal and spatial control for two Late Preclassic ballcourts. The degree of similarity between the two courts strongly suggests a standardization of the ball game at this time and place. Although certain minor differences between the courts are apparent in terms of range construction and court dimensions, the amount of variability within each structural group would appear to be as great. (See Table III.) In addition, some of the variability may be attributable to the various degrees of preservation in which we have found the features discussed.

The ball game played in a masonry court is a characteristic feature of Mesoamerican civilization (Borhegyi 1969). This game, associated with elite activities, had both religious and social significance (Adams and Culbert 1977). Drawing specific analogies to Cerros from other areas in the Maya Lowlands have been difficult due to the lack of a comparable Late Preclassic period data base. However, early formal ballcourts have been found outside the Maya area at sites which show evidence for the development of social complexity including monumental architecture. An examination of the distribution of these courts suggests that the game spread as part of a complex of iconographic and ideological traits from the lowlands of Tabasco and Veracruz into the Maya region.

TABLE III

CERROS COURTS COMPARED*

	Bench Face		Bench Top		Ratio	Playing Wall		Alley		Alley Ratio	Ends
	H	Slope	W	Slope	H/W	H	Slope	L	W		
Cerros 61	1.02	20°	2.5	1°-2°	.42	.60+	36°	16.0	3.8	4.20	Open
Cerros 50	1.1	50°	3.0	0°	.37	.50+	70°	18.0	4.2	4.30	Open
Cerros 50sub	1.33	35°**	3.0	0°	.44	.50+	70°	18.0	4.2	4.30	Closed and Sunken
Monte Alban dated M.A. III	1.0	49°	1.8	0°	.56	6.5	33°	26.0	5.0	5.20	Closed and Sunken
Piedras Negras (RII)	.8	33°	2.5	0°	.32	3.0	36°	18.0	4.3	5.14	Closed
Yaxchilan I	1.4	28°	3.0	2°	.47	2.75	58°	19.0	4.5	4.20	Open
Yaxchilan II	1.0	27°	4.0	7°	.25	2.4	39°	18.0	5.0	3.6	Open
Chijolom 3-4	1.0	49°	2.9	0°	.34	1.25	67°	17.5	4.2	4.17	Open
Copan	0.7	75°	7.0	25°	.10	1.0	90°	26.8	7.0	3.8	Open
Palenque	.9	90°	2.5	0°	.36	3.0	58°	22.0	2.7	8.1	Open

*After Quirarte 1972: Appendix.
**Angle taken from south end of sunken batter surface.

It should be noted that the apparent standardization of the game at Cerros may indicate a shared system of government and beliefs during the Late Preclassic period in the Maya Lowlands (Freidel n.d.), divorced and transformed from those earlier antecedents.

The earliest suggested evidence for a pre-Columbian ballcourt comes from the Stirling Group at the Olmec center of La Venta (Wyshak and Berger 1971). Although ball player figurines from San Lorenzo suggest the appearance of the game earlier (1150-900 B.C.; Coe 1970), excavations at La Venta indicate the formal presence of a ballcourt radiocarbon dated to 760 B.C. (Wyshak, Berger, Graham and Heizer 1971). Little is known of the form of this court other than that it appears to be of the open ended type. Three sites in southern Chiapas which date to the Modified Olmec Escalera phase (650-550 B.C.) are also known to have ballcourts (Lowe 1977). These sites, Finca Acapulco, Vergel and San Mateo, have a linear arrangement of monumental architecture similar to that at La Venta. Dating to about this same period is a court at the site of San Lorenzo (Coe 1970; Coe and Diehl 1980). This court dates to the Palangana phase (600-400 B.C.) and is part of renewed construction activity at the site following a hiatus at the end of the Olmec occupation there. This phase shows ceramic ties to the Middle Preclassic Mamom of the Maya Lowlands.

Unfortunately detailed information is not available on these courts, but they all appear to have been open ended types.

At Monte Alban in highland Oaxaca, the earliest of two superimposed courts dates to Monte Alban II (Acosta 1965) or between 200 B.C. and A.D. 200. Another ballcourt recorded briefly from the same area, at San Jose Mogote, and dating to Monte Alban II times is argued to be so similar to the late Monte Alban III example at Monte Alban that a standard plan for these courts has been suggested (Flannery and Marcus 1976). To date, these courts appear to be the only ones contemporaneous with the courts at Cerros. In Quirarte's (1972) typology of ballcourt architecture, the Monte Alban III court represents a Type II structure. Although the Cerros ballcourts do not fit precisely into Quirarte's scheme, they perhaps best resemble his Type II or IIa. This similarity in profile and plan between the Oaxacan example and the Cerros courts is further supported by the stepped stone masonry underlying the plaster batter surfaces of both groups of courts. In addition, the presence of possible outset bench corners and the sunken playing field of the initial Structure 50 Group has strong affinities at least to the Monte Alban III court and perhaps to the San Jose Mogote case.

Although ballcourts are rare in the Maya lowlands until the Late Classic, two Early Classic courts have been reported. At Copan, the earliest court is the first of a series of three superimposed courts at the site (Stromsvik 1952). Although it is open-ended like the courts at Cerros, the bench tops are slanted like the later Copan courts. It should be noted that both the Copan and the Monte Alban ballcourts share with the Cerros courts a marked north/south orientation. In addition, it should be noted that in the Guatemala Highlands, Brown (1973) has reported an Early Classic or Middle Classic ballcourt at Kaminaljuyu which maintains this north/south orientation. Palenque is the second site in the lowlands reported to have a court dating to the Early Classic (Rands 1977). The form of this court is understood to be of the Type IIa in Quirarte's classification. The scarcity of Early Classic as well as Late Preclassic ballcourts is probably due to their burial at most sites by later construction episodes.

CHAPTER VI

LATE PRECLASSIC CANALS AT CERROS

Water management is a recurrent theme in pre-state and state development and must be considered an important element in the evolution of Late Preclassic period Cerros. The canal excavations were conducted to better discern the hydrology at Cerros. The precise areas selected for intensive investigation were determined by the fortuitous identification of an earthen platform complex associated with a southern section of the main canal.

The main canal circumscribes the most dense and massive concentration of structures at the site. It extends over 1200 meters forming a great arc with its focus at the central precinct. The 37 hectare area enclosed by the canal contains 95 mounded features. This area is comparable to that enclosed by the Late Preclassic (Pakluum phase) ditch at Becan, Campeche (Bell and Andrews V 1978; Webster 1976).

Surface elevations indicate a gentle gradient of less than one meter descending from west to east across the site from within the infilled canal. Little consistent drop in elevation can be detected along the banks of the canal or at other adjacent areas of high ground. The

canal traverses three microenvironments in its swing around the site. Much of the canal passes through the depressed bajo-like setting characterized by hulub (Bravaisia sp.), entanglement and poorly drained dark gumbo soils. The hulub bajo setting dominates the eastern and far-western portions of the main canal, although most of this setting lies outside the canal. The section of the canal to the south appears less depressed being defined by thorn scrub savanna (Wiseman 1978) and thin clayey topsoils inside the area circumscribed by the canal and patches of better drained high ground monte alto setting outside the canal. The canal is wider and generally less distinct in the hulub bajo localities.

The canal was initially discovered as a result of its depressed appearance in spite of two millenia of infilling, and its relatively sparse cover of vegetation. The latter is thought to be a function of the impermeable clays which have infilled the canal as well as the depth of the present trough. These two factors are believed to have prolonged the annual period of ponding and prevented many species from adapting to the condition. However, the canal is dry during part of the dry season. Another factor affecting the canal's visibility is that the climax vegetation was removed recently, although secondary and tertiary seres have rapidly moved in. Aerial

photography has further verified the extent of the canalization at Cerros.

Dam-like features were recorded bridging the canal at various locations. Six of these features have been defined measuring approximately five by ten meters, although the present surface dimensions vary from feature to feature. These dam-like features are best defined along the southern section of the canal, in areas of less depressed terrain, although this may be a consequence of preservation.

Major feeder canals issue from the main canal at five known locations and seem to diverge at any angle from the canal. The segments vary in length, the longest being over 100 meters. These lateral canals appear to be wider and shallower than the main canal, at least when compared with the narrow southern section of the main canal. In two instances, the lateral canals flow into small elliptical depressions, thought to be reservoirs or catchment basins. Within the survey area numerous depressions or small seasonal reservoirs have been recorded. although some of these features may be <u>dolinen</u> or sink holes and attributable to natural processes (Sweeting 1973; Siemens 1978:136), many are associated with concentrations of mounded features.

At the north end of the major feeder canal (F122) issuing into the site area defined by the main canal are

positioned a minimum of four earthen platforms whose dimensions range from 11 by 16 m. to 19 by 34 m. They are oriented to the cardinal directions. (See Fig. 74.) Each platform is thought to be circumscribed by a narrow shallow channel, although siltation of these minor feeder canals has somewhat obscurred their definition. Although the vegetation is somewhat more sparse within the canals than on top of the earthen platforms, aerial photographs taken at approximately 1:1500 do not reveal these features. The surficial height of the platforms above the infilled canals is less than 30 cm. according to our spot check elevations and locations. (A transit contour map was made in the field of the half hectare area most intensively investigated for hydraulic control works. The earthen platforms were simply pace and compass mapped.) The platforms at this location occupy a depressed thorn bush savanna microenvironment heavily invaded by muk (Dalbergia sp.) and katsim (Acacia sp.) and characterized by thin clayey topsoil, although the setting is better drained than the hulub bajo location.

Water management elsewhere in the settlement has been recorded. Seven earthen platforms defined by a shared system of channels have been pace and compass mapped at the margin of the New River's northeast floodplain zone, approximately 1100 m. southwest of the main canal. The platforms appear to be oriented

perpendicular to the present shoreline (N115°W) rather than to the cardinal directions as is the case with the platforms in the center. The platforms vary in dimensions but fall within the range of those described in the center, although they occupy a more bajo-like setting. House mound density drops off significantly as one approaches this setting. No controlled excavations have been conducted in this location, but surface collections from the eroding shoreline suggest an Early Classic date.

Excavation of the Features

Our excavation and recovery techniques involved the excavation and screening of naturally defined levels. Flotation samples were run from each stratum in the field and microfossil examinations are currently underway. Pollen samples from 16 contexts are presently under study as are chemical and physical soil tests. (See Appendix II for preliminary assessment of soils.) The latter are anticipated to aid in determining the origin and fertility of the sediments in question.

Excavation of the main canal has been carried out along the south central portion of the feature. This location was selected because the canal relief contour was well defined and in proximity to the known earthen platforms. One of two trenches at this location was placed across and parallel to the long axis of one of the dam-like features in an attempt to obtain a

cross-sectional history of the infilling operation relative to the canal itself. This location was also selected to obtain an adequate sherd sample for dating the constructional episodes of the canal (after Puleston and Callender 1967:43). A second trench was placed 14 meters west of the first in an attempt to reveal any local variability between the two sections. The cross sections appear to correlate between the two exposures. The initial canal was excavated through limestone caprock to a depth of two meters and a width of six meters.

Our initial trench across the dam-like feature exposed 26 square meters to a maximum depth of two ms. (See Fig. 75.) The basal canal sediments were exposed in a one by two meter exposure only. The bottom of the canal was defined by a sterile white friable marl as well as the dry season water table. All canal sediments were moist. A five cm. thick dark blocky loamy clay overlay the parent material, although it feathered out near the center or bottom of the canal. The matrix was not viscous. Overlying and intruding into these matrices was a 20 cm. layer of decomposing angular limestone gravel, in the form of small cobbles overlain by pebble size gravels. Again, the concentration of gravels was thickest on the southern side of the exposure and found to pinch out toward the center or bottom of the canal.

The next stratigraphic level represented the bulk of the canal sediments. Most of the 1.5 meters of friable blocky grey clays were removed from the entire horizontal exposure. These clays were found to grade from darker to lighter value (after Munsell chart) as we ascended the profile, although no boundary between the sediments was discernable. No microstratigraphic control of these sediments was possible as chemical recrystalization and the effect of burrowing snails have altered their appearance. The darker grey clays near the base of the exposure were more compact than those deposited later. A pure Late Preclassic sherd sample was taken from these grey clays. In addition, fragments of bone, charcoal flecks and stone debitage were recovered.

Capping and intruding into the canal sediments at this location was an infilled lazy-U-shaped deposit, three meters in length and 80 cm. in maximum depth, grading from a dark loamy clay at the top to a light grey clay near the bottom. The sediments were a loose, blocky clay heavily intruded by limestone gravel ranging in size from pebbles to large cobbles. Although the texture, structure and consistency of the fill seemed similar throughout the deposit, the upper 40 cm. was of a darker value being faintly segregated from the lower 40 cm. by a gradually smooth boundary. A somewhat similar deposit to that described for the lower 40 cm. of light grey clay

within the infilled U-shaped lens was found to intrude into the underlying grey clays near the northern margin of the canal profile. It was intruded by coarse pebble size limestone gravel to a depth of 80 cm. (See profile). Early Classic ceramics were the most recent diagnostics taken from this infilling operation (Robertson-Freidel personal communication).

Decomposing limestone and gravel were found on the immediate northern and southern margins of the canal sediments. Thin discontinuous lenses of granular friable yellow marl issued from the upper decomposing northern limestone caprock defining the vertical bank or side wall of the canal. Excavation through 40 cm. of the decomposing limestone caprock revealed the massive indurated caprock defining the lower reaches of the canal side walls. The original canal cut profile was a U-shape with a less steep southern slope forming an approximate 45° angle with the flat bottom. Overlying the decomposing upper caprock at the banks of the canal was a continuous 10 cm. layer of mottled grey clays similar to those defined within the canal. These clays spill into the canal section. The complete excavation exposure was capped by a dark viscous blocky loamy clay intruded by pebble to small cobble size limestone gravels.

The second trench was placed across and perpendicular to the long axis of the main canal. Its precise

location was selected to explain an apparent constriction in the width of the canal at this location. It was also anticipated that less energy and time would be expended to obtain an additional cross-section given the narrowness of the canal at this location. The excavations represented an eight square meter horizontal exposure to a maximum depth of 1.6 meters. (See Fig. 76.) The same blocky, friable, light grey clays resealed in the initial trench were found to comprise nearly all the fill in this exposure. Although we were unable to "bottom out" or define the basal sediments in the canal, we did identify the near vertical northern canal side wall. It was the same granular friable yellow decomposing limestone as defined in the first trench. The yellow limestone matrix was again found to spill into the grey clay canal sediments producing thin discontinuous lensing. Below this lensing and within the grey clays was collected a pure, although obviously unsealed, Late Preclassic ceramic sample. A large chert blade was also recovered.

South of the northern exposure we identified a shallow single course concentration of small cobble size limestone gravel. These stones lined the remainder of our exposure which extended approximately six square meters to the south. These stones formed a lazy asymmetrical U, having a steep northern side wall in cross-section. The sediments probed below this feature

revealed the same light grey clays as located to the north of the stone lining. The sediments overlying the stone feature were a slightly darker grey clay of the same texture, structure and consistency as those below. Overlying the entire deposit was a 10 cm. layer of dark, blocky, viscous clay loam. Soil cracking was apparent at this level and chemical recrystalization and intrusive snails (principally Pomacea) were apparent throughout the light grey clays. An Early Classic date has been assigned to the debris taken from above the stone lining.

Forty-five meters northeast of the dam-like feature, another trench was positioned across the width of a major feeder canal issuing from the main canal. This lateral canal lies at a right angle to the main canal and extends northward for over 70 meters. At the northern end of the major feeder canal, the channel takes an abrupt dogleg west. At this location, the contour map indicates a small reservoir or catchment basin. This canal was selected for investigation due to its linkage with the defined earthen platforms. The specific location of the trench was chosen because of a well-defined eastern canal bank which would provide a convincing profile for the canal section. The construction of this feature was apparently not modified through time as was the main canal. The major feeder canal was much shallower and wider than the main canal, being approximately 90 cm.

deep and at least eight meters wide. This canal was defined by a shallow dish-shaped cross-section cut into the limestone caprock, although our excavations did not extend far enough west to define the exact nature of the opposite bank. The flat bottom of the canal rose at a 45° angle in forming the eastern bank.

Eight square meters of deposit were removed to a maximum depth of 90 cm. The fill was the same homogeneous blocky, grey clay defined in the main canal section, although it appeared to be of a slightly lighter value. The fill was not heavily intruded by limestone gravel, although a few were removed. The sediments were recrystalized and affected by gastropod intrusions (Pomacea). No microstratigraphy was evident. Overlying the 80 cm. of grey clays was a 10 cm. cap of blocky, dark clay loam topsoil. The boundary between these two layers was not abrupt but graded from one to the other. The underlying parent material defining the canal was the same yellow limestone overlying the undurated caprock. The bottom of the canal was overlain by a decomposing limestone gravel and the eastern bank as defined by the yellow decomposing limestone. Although the ceramic sample was a small, mixed one, the great majority of identifiable sherds date to the Late Preclassic period.

Four earthen platforms were located at the termination of the above lateral canal. Excavations carried

out within and between two platforms revealed a narrow shallow channel (one by one meter) believed to circumscribe each platform. Our trench was positioned to expose both the matrices of the earthen platforms and the profile of a minor feeder canal. The exact position of the trench was chosen because of the relief found at this location. Nine horizontal square meters of deposit were removed to a maximum depth of 80 cm. (See Fig. 77.) The canal section was defined in part by a sterile off-white granular friable marl. Excavations into the flanking platforms suggest that this sterile sediment may have been intentionally mounded although the matrix was quite mottled. Lying above and intruding into the off-white clay were smooth, although pitted cobble, to small boulder size limestone gravels positioned to form an ill-defined lazy, asymmetrical, U-shaped cross-section. Although the canal is thought to have been defined by these uncut stones, some of the stones have fallen from their original position. Overlying and settling between these stones were located dark blocky friable grey clays similar to those defined in the other canal sections. These sediments accounted for 80 cm. of the canal fill, and in turn were capped by a 10 cm. thick lens of dark, blocky, viscous, organic-rich clay loam topsoil. Again, the sediments appear to be recrystalized and intruded by snails, although some lateral lensing was apparent.

Ceramic debris taken from within the canal was badly mixed, spanning all periods of occupation represented at Cerros.

On either margin of the stone concentration we exposed the adjacent platforms. Excavations were taken down to a depth comparable to that reached in exposing the flanking canal segment. Exposure of the northern edge of the southern most platform revealed the off-white granular friable clay overlying the decomposing yellow limestone caprock. Although the off-white clay marl was severely mottled by the same post-depositional agents responsible for the condition of the canal sediments, the lens appeared to be thicker at the canal bank margin, contouring to the position of the overlying stone concentration. The southern end of the lens gradually sloped down out of the profile.

The sediments overlying this mounded deposit were a lighter blocky friable clay seemingly identical to those sediments within the canal, except for the color difference. The maximum one meter deposit was severely mottled and appears to have graded smoothly from the basal light clays to the surficial dark clays. High phosphorous readings have been recorded in this platform. The surface of the platform was covered by a 10 cm. thick blocky viscous organic topsoil. Soil cracking was in part responsible for the mottled appearance of these sediments. The exposure on the northern most platform

was excavated down to a level 30 cm. higher than the maximum depth elsewhere in the operation. However, it should be noted that exposure was taken down to the level of the basal rubble lining the ditch and not one stone was found in the fill of the southern platform. A few pebbles were removed from the northern platform. The ceramic sample from the fill of the two platforms, while small (less than 100 sherds), was exclusively Late Preclassic (Robertson-Freidel personal communication). These sherds were large and unweathered; trash in the form of lithic debris and bone accompanied these sherds. The ceramic sample from within the ditch defined by the rubble linings included both Late Preclassic and Early Classic diagnostics. These sherds were badly weathered (Robertson-Freidel personal communication). Given that the platforms are artificial constructions containing exclusively Late Preclassic diagnostics, we infer that the fields were built during this period. The presence of Early Classic material in the ditch is not surprising because nearby mounds show evidence of ephemeral reoccupation during this period. The weathered quality of the sherds in the ditch proper suggests that the silting in was a slow process and that the ditch was still open following the Late Preclassic abandonment of Cerros well into the Early Classic period.

Interpretations

As has already been stated, the main canal was excavated to a depth of 2 m. and a width of 6 m. through limestone caprock. It is unlikely that the canal was excavated by a natural river course which was later dredged of sediments as the width of the canal is much narrower than that of the nearby voluminous New River. In addition, the canal profiles reveal a steeply banked U-shaped cross section rather than the lazy asymmetrical U-shaped cross section anticipated for a meander at this location (Blatt, Middleton and Murray 1972:136).

Moreover, although the fill was not thrown up to support a rampart or parapet of any consequence, it was apparently used in the construction of various mounded features within the settlement. (See Appendix 1.) The absence of a substantial rampart at Cerros does not deny the existence of a defensive function for the feature, but it does suggest that the fill from the canal was valued more for raised platform space than for protection from outside attack. Wooden palisades are reported during the Conquest in the Chan Maya province (Thompson 1977) and the use of thorn bushes, such as the various species of <u>Acacia</u> could have provided an adequate deterrent to most intruders. (Millon indicates a possible

defensive function for the nopal cactus at Teotihuacan) (1973:40).

Such multipurpose canalization is suggested at Edzna in an examination of the main canal feeding the moat surrounding the "fortress" (Matheny 1976, Figure 3; 1978, Figures 10.7 and 10.8; Hauck, 1973). These features relate to emic boundaries of the site; an undeniable barrier to outsiders questioning the perimeters of the site. The short-term benefits of the earthworks would be the obvious defensive advantage during attack. The long-term advantage would be the simple knowledge of its existence to those outside as well as inside.

Following the construction of the canal, the bottom accumulated a thin ephemeral lens of black sediment lying upon impermeable parent sascab (limestone marl). This sediment is thought to represent a humate horizon which eroded from the banks of the canal. It is argued that the adjacent fields were abandoned and left unmanaged which resulted in the present inverted stratigraphy in the canal. The thick blocky deposit of grey clays are suggested to have been raised field platform matrix. The grey clays grade from lighter to darker as we descend the stratigraphy with the expectably richer humate content occurring in the lower reaches of the profile. The stone and gravel found near the bottom of the canal is in part decomposing bedrock, but it may also represent an ancient

retaining feature supporting the earthen platforms that washed out of the suggested collapsed fields.

The argument that these sediments have eroded from the banks of the canal is supported by (1) the absence of microstratigraphy, possibly indicative of a rapid infilling episode following the abandonment of the site at the end of the Late Preclassic period, and (2) the slight bit of lateral lensing from the upper reaches of the canal, as well as the thinning lateral slope of the basal canal paleosol.

Following the partial infilling event of the canal, there appears to have been a period of restoration and reuse which culminated in the dam-like feature in the eastern most exposure and the later stone lined canal segment overlying the grey clays in the western trench. The dam-like feature has provided a somewhat-sealed context for dating the abandonment or disuse of the initial canal. From this eastern most trench we have obtained sherds dating exclusively to the Co'h phase. In addition, we collected a carbon sample from near the top of the grey clays in anticipation of a terminus post quem for the abandonment of the initial canal construction. However, the calibrated C_{14} date of 422±180 B.C. (SMU radiocarbon lab personal communication) suggests the relocation of earlier trash believed to be associated with the initiation of the main canal (Co'h phase). It

should also be noted that some Pomacea shells were capped by the dam suggesting the freshwater environment in which these grey clays were deposited.

The two trench exposures suggest contemporaneity in terms of complimentary architectural form, as well as in the appearance of basal flange bowl elements for the first time in the canal sediments. The latter occur in the stone fill of the dam-like feature and above the stone lined canal segment. It is argued that at this later moment in the prehistory of the canal, this segment between our two trenches functioned as a catchment basin for run-off from the deflated and collapsed field area. The absence of stone lining associated with the foot, and adjacent area of the dam-like feature suggests that the narrow shallow lining defined in the western trench was designed as the constricted mouth of a small reservoir. The elevated position as well as the constricted mouth would trap a considerable amount of water during the dry season following the rains of May through October. The position of the feature suggests that the water filling the reservoir entered from the west. If these features are Early Classic in date, it is tempting to consider the ephemeral Early Classic component at Cerros as responsible for modifying the canal to utilize the previous drainage qualities of the hydraulic system. The absence of substantial amounts of the presumably redeposited raised field

grey clays above the exposed features would suggest little concern with intensive agricultural management at Cerros during these later periods, a thesis in keeping with the less structured populations aggregates suggested by the house mound survey program. It is likely that the later residents of Cerros viewed the original canal as an impediment to traffic and a breeding ground for insect pests rather than a useful hydraulic system. The dam-like feature may have been as important as a causeway as they were any other function.

The major feeder canal is defined by a shallow dish-shaped cross-section cut into the limestone. Our excavations of the main canal as well as in other locations where we have contacted caprock indicate that the upper 40 cm. of limestone is quite friable as a result of ground water percolation. It is suggested that once the main canal was established and quarrying activities for building stone were satisfied, further energy expended in the acquisition of additional stone became unnecessary. It, then, was easier to remove a wider section of canal, than to excavate deeper to obtain the same water volume capacity for the major feeder canal.

The expected amount of light grey clays have infilled the major feeder canal. These sediments are identical to those defined in the main canal and are also attributed to the suggested raised field platform

erosional displacement. The absence of a redeposited paleosol at the bottom of the major feeder canal analogous to that described for the main canal is thought to be a function of the original drainage gradient. The higher elevation of this canal segment would tend to redeposit some sediments into the main canal until a gradient equilibrium could be established. It should be noted that the majority of identifiable sherds from this trench dated to the Late Preclassic period.

At the north end of the major feeder canal are positioned four earthen platforms which have been interpreted as deflated raised field platforms, although a residential function is also suggested. Each platform is flanked by a narrow system of minor feeder canals. The infilled matrix within each canal is identical to the grey clays found elsewhere and believed to have been eroded from the adjacent platforms. Of particular interest in our excavation is the presence of small, uncut, boulder size limestone gravel resting in a manner that suggests their previous function as a stone retaining feature supporting the flanking platforms, as well as defining the width of the minor feeder canal. Although affected by leaching, the profile reveals what appears to be a shallow sascab bank which may have formed a diminutive levee into which the stone retaining feature would have been buttressed. Functionally, this would have

prevented water from saturating the adjacent platform fields (due to the impermeable nature of the sascab) and inciting root rot as well as preventing water from dissipating into the fields in a premature, uncontrolled manner. The retaining feature would have aided in preventing the slumping of the fields into the canals, reducing the amount of time and energy necessary for maintenance as well as securing spatial boundaries.

The cross section of the two adjacent fields was somewhat discouraging. Lateral slumping and erosion into the system coupled with leaching, wet/dry soil cracking episodes and snail (Pomacea) burrows have produced a mottled profile. The fields are believed to have been raised higher during the Late Preclassic period but never elevated by sascab platforms (Puleston 1977, 1978). Although the soil tests are subject to interpretation, it is possible that the naturally low phosphate content of the soils on the peninsula (Wright, et. al. 1959) was increased in part by mixing beach sand with the naturally occurring clays. This would also produce a more fertile loam than that made available by the indigenous clays.

The ceramic sample obtained from this exposure has produced a collection of sierra red wares. Large sherds, charcoal flecks, bone fragments and high phosphate concentrations may suggest the presence of kitchen compost deposited to enrich the soils (see Wilken 1969:231). Our

excavations at the margins of presumed house mounds at Cerros have not produced the midden debris reported from other sites (Haviland 1963, Fry 1969, Stoltman 1978). However, isolated post holing in depressed locations has frequently produced thin trash deposits or sheet midden. Although domestic trash may have been deliberately redeposited on the fields, its source is unknown. It is possible that the fields were maintained by households residing on the platforms, practicing a form of infield gardening (Netting 1974, 1977). Considering the absence of well-defined house mound features inside the area defined by the main canal as well as the presence of a densely occupied, ground level village on the coast during the initial phases of the site, it may have been that low earthen residential platforms were the rule at Cerros during the Late Preclassic period.

In conclusion, evidence supports the presence of drained fields at Cerros. The apparent system of reservoirs and canals would have permitted limited pot irrigation and potable water supplies through the dry season given the presence of evaporation retarding aquatic plants and other conservation measures. In the Highlands, canalization has been hypothesized as early as the Tzacualli phase (Terminal Preclassic) at Teotihuacan (Sanders 1976) and empirically demonstrated on a diminutive scale at Hierva el Agua in the Valley of Oaxaca

during Monte Alban I (Middle Preclassic) (Flannery, et. al. 1967). Chinampa agriculture as early as the Preclassic period is suggested near Tlaltenco in the Valley of Mexico with the construction of a man-made island (Armillas 1971). Coe (1964) indicates a similar date. However, a canal as substantial as the one shown at Cerros has not been demonstrated elsewhere in Mesoamerica until the Palo Blanco and Venta Salada phases in the Valley of Tehuacan, Puebla (Classic and Postclassic) (Woodbury and Neely 1972) or at Santa Clara Xalostoc in the Basin of Mexico and assigned a Pre-Coyotlatelco Phase (Classic) date (Sanders and Santley 1977). However, it should be noted that Snaketown has revealed well developed canalization as early as the Pioneer phase 300 B.C.-400 A.D. in the American Southwest. (Haury 1975) Although Late Preclassic canals are reported at Edzna, Campeche (Hauck 1973, Matheny 1976, 1978) the exact nature and extent of canalization during the Preclassic period is not fully understood.

CHAPTER VII

SETTLEMENT SURVEY

Reconnaissance

During the course of the Cerros survey, considerable survey reconnaissance was undertaken to better understand the geographic position of Cerros relative to other centers near the Lowry's Bight sustaining area. In our spare time, the crew attempted to follow up as many leads concerning additional sites as possible. Most of our initial locational information came from local informants who accompanied us into these remote areas. A Brunton compass and a sharp machete were the only survey instruments employed in this type of data retrieval.

Two preliminary sketch maps are provided of the central precinct zones for Saltillo (see Fig. 8) and Hillbank (see Fig. 7). The site of Hillbank lies 15 kilometers south/southwest of Cerros between the New River and Freshwater Creek. It is described as a major ceremonial center in Hammond's typology (1973). The Saltillo site lies 6 kilometers to the southwest of Cerros near the first river terrace of the New River. It is referred to as a minor ceremonial center in Hammond's typology (1973). Gann appears to be the first author to

have made reference to the site (Hammond 1973:9). Our cursory collections indicate a Late Preclassic and Early Classic period occupation derived from fill ceramics within looters' pits at both sites. Hillbank further reveals a substantial Late Classic component.

The areal map is provided to geographically fix the locations of the sites. (See Fig. 6.) Hillbank is not located on this map, but Hammond (1973) has it closely approximated. The size of the blackened dot refers to the predicted size of these sites relative to Cerros. It should be noted that Point Alegre has not actually been visited by members of the Cerros Project. It was plotted with the aid of Roberto Pott of Chunox village who has been there. Small surface collections suggest that San Antonio and Ramonal date to the Early Classic period. A recent road cut indicates a similar date for Chunox. Aventura has been assigned a Protoclassic component as well as a major Early Classic occupation (Sidrys to Hammond 1977).

The side-looking airborne radar (SAR) readout has been provided courtesy of R. E. W. Adams. It has been superimposed on the map to stress the amount of potential canalization in the area. We have no ground-truth survey for the presence of these alignments.

Lowry's Bight has been defined as the settlement sustaining area for Cerros. (See Fig. 5.) It has been

delimited by an arbitrary line drawn from the mouth of the New River to the mouth of the Freshwater Creek. It has been argued that if a defensive palisade, or earthworks, existed at the margins of the potential sustaining area, it would be most effectively positioned at this location (Scarborough 1978). In addition to preventing the trespass of landward intruders, it would have permitted a tight control of the maritime traffic using two of the three major rivers servicing northern Belize. The sustaining area as defined by this boundary line between the New River and Freshwater Creek contains an area of 9.63 km^2.

Our reconnaissance of the Lowry's Bight sustaining area included a survey by boat of the shoreline. No mounded features were identified, but the dense waterline vegetation probably prevented an accurate appraisal of the frequency of mounds. The extent of the major <u>bajo</u> at the tip of the bight was confirmed through boat survey.

Reconnaissance along the road to Chunox via Copperbank indicated the infrequent presence of mounded features at the boundary of the potential sustaining area. No preserved evidence can be presented for artificial earthworks at this location. A shallow vertical thrust block fault zone was apparent at this approximate location. An examination of the aerial photographs (1:50,000) indicates that this same area was the former

course of an ancient drainage probably associated with the New River (see Physical Environment). More recent data provided courtesy of R. E. W. Adams indicate that this depressed area is in association with the SAR dentritic patterns thought to be indicative of raised field agriculture.

Bush trails were cut along promising corridors in search of mound clusters. The margin of the large *Aguada* 2 was examined for mounded features in this manner and later the northeast side was systematically surveyed. Another short excursion was cut into the mangrove and *hulub* setting defining the first river terrace at the end of the western *brecha*. Additional raised field platform islands were suggested.

An old trail passing through the western margin of the south/southwest transect was followed to its termination at Esperanza Bight. An Early Postclassic midden deposit, identified by the surface collected ceramic assemblage (Robertson-Freidel personal communication) was found near a recently abandoned wharf at this location. This site extended along the south side of a shallow embayment and covered an area of approximately 2500 m^2. No mounds were identified in the immediate area, nor were any found at the margins of the embayment. A dense *hulubol* was negotiated in attempting to follow the

trail to Esperanza Bight. It is understood to be the mouth of the ancient river drainage mentioned above.

No mounded features were noted along this trail into the interior with the exception of one Type 2 plazuela group resting about 400 m. south of our southernmost systemic survey pin on the south/southwest transect. This group lies on the western side of the road and appears quite isolated. The setting is a well-drained monte alto, although a small aguada lies to the immediate north of the feature. This area rests within the featureless terrain thought to be little disturbed by quarrying activities. However, the aguada may reflect the fill source for the plazuela group. The form and orientation of this plazuela is not unlike the Structure 11 Group.

Systematic Survey

Three bechia, or transect lines, were located 200+ m. outside the main canal radiating from the margins of the major survey block surrounding the site. The chief reason for these transects was to test the hypothesis that mound density dropped off outside the core site area. (See Fig. 4.)

The south/southwesern transect line I (oriented N155°W) extended 500 m. from a point near the center of the southern margin of the major survey block. This point lies approximately 1 km. south of the central precinct. The width of the transect was originally

intended to be 200 m., but the area was increased as a consequence of encountering an old trail along the western edge of the transect. The trail was outside the defined transect area, but because visibility was good along its path, an added 40 m. strip was surveyed at little additional cost. The area to the east was widened to better assess the mound density in this area. Because four mounds were encountered at the margin of our transect, we elected to systematically extend the width of the brecha another 60 m. to insure that no mound complex lay in immediate proximity to this concentration. As a routine event, we always examined a radius of 30 m. around a mound which lay at the margin of our systematic survey area. This lessened the severity of "boundary effects" in interpreting our data. The final width of the transect was 250 m.

The sparse frequency of mounded features suggests that the interior of the bight was not densely occupied. A mound density decrease is apparent. The brecha was not extended further because our reconnaissance along the trail mentioned above did not indicate significant mound densities. Although we did not confirm this expectation at this location with additional controlled systematic survey data, it was deemed more important to augment our sample of Late Preclassic mounded features than systematically survey an area of extremely low mound frequencies.

The transect environs were generally more depressed than in other transect locations which may have affected settlement density to a degree. Some of the shallow depressions were natural but others may have had a cultural origin. The presence of pits and runnels dropped off significantly at the 102 m. contour interval. Scattered surface collections of badly weatherd ceramics were periodically noted along the transect, suggesting the presence of ground level structures. This may be further suggested by the isolated well, or chultun, resting 80 m. west/northwest of the nearest mound Structure 150.

The southeastern transect line II (oriented N130°E) extended 1 km. into the interior from the same point on the southern margin of the major survey block as the south/southwest brecha. The line terminated at the southeast side of Aguada 2. The transect was 200 m/ wide and shifted 100 m. to the northeast around the aguada perimeter to avoid the waterline and to better examine the edge of the feature. The transect was intended to further test the proposition that mound density decreased as one entered the interior of the bight. The specific direction of the brecha was designed to elucidate the relationship between the large aguada and the core area. The canal had demonstrated the presence of a sophisticated water management scheme and the role of the main aguada

was thought to figure into a water management scenaria, perhaps at an earlier time in the prehistory of Cerros.

The transect revealed a slight natural ridge running parallel and within the survey brecha. Although this area was elevated above the surrounding terrain and consisted generally of some of the best drained land on the peninsula (monte alto and huamil settings), only three mounds were discovered. The structure nearest the aguada lay 200 m. to the north and no structures were noted within 100 m. of the aguada margin. However, ceramics dating to the Ixtabai phase were surface collected at the periphery of the aguada and may indicate a ground level community at this location at that time. The presence of a well, or chultun, 80 m. southeast of the nearest mound adds further support for the presence of the ground level structures. It should be noted that the northern margin of the aguada has been modified by recent construction, although it has been reclaimed by the vegetation.

The terrain along the transect was featureless above the 101.5 m. contour interval. From that contour on to the north, the terrain was more pitted and scarred and graded into the thick hulubol defined immediately to the east and south of the main canal. Only three mounds were defined in the entire 20 hectares covered by the

transect. Mound density strongly drops off into the interior of the bight.

The final survey transect line III was oriented to the west/southwest (N115°W) along the present Corozal Bay shoreline. The line issued from a midpoint along the western edge of the major survey block. The transect was designed to be at least 800 m. long and 200 m. wide. As it turned out, it was at least 300 m. wide at most locations, because of the irregular nature of the shoreline. The orientation of this transect was again positioned to assess the density of house mounds in the western periphery of the site. Both the role of the shoreline and the affects of the New River were anticipated to modify the predicted mound decrease in this zone. A sizeable mound component was identified in this sector of the periphery. Thirty-one mounds were identified and mapped in the 22 hectares surveyed. This mound density and its distribution are unlike that of other areas in the periphery. The unordered orientation and small size of these mounds suggest that they represent a segment of the service population at Cerros. Although a bit of Early Classic debris was surface collected from this transect, these structures may date to the Late Preclassic period. The settlement design in this area is more similar to the Late Preclassic settlement of Komchen (Andrews V n.d.) than to the community deposition inside the main canal.

The location of the service population at this position in the site may suggest the community's dependence upon shoreline exchange even among the sustaining population. Even if subsidence and sea level rise have changed the geographic position of the shoreline, a clear adaptation to the riverine estuary is indicated.

The terrain in this area is generally better drained but severely pocked and pitted. These shallow scars are thought to be attributable to the quarrying activities associated with these presumed house mounds. Unfortunately, no excavation has yet been conducted to confirm or disconfirm the presence of household features. There is little indication that well organized hydraulic control works directly affected these mounds.

At the western end of our transect on the banks of the first river terrace, we located at least nine earthen platforms understood to be raised fields. Although no temporal control could be attached to these plots, proximity to the mounds in this area would suggest a coeval date. Nine wells, or chultun depressions, were located in this area, perhaps further arguing for a domestic locus in the western periphery. Five of the nine wells are unassociated with mounded features, suggesting the presence of ground level structures in the vicinity.

The portion of the systematic survey area outside the main canal but within the major survey block was surveyed during the 1978 and 1979 field seasons. Twenty-one hectares along the southern margin of the survey block were surveyed in 1979 but were not included in our excavation sample population (as was the case with the three brecha lines). This area was well-drained huamil to the west and poorly drained hulubol and huanal to the east. The sizeable Aguada 3 resting in the southwestern corner of the survey block appears to be man-made and associated with the complex of structures in the immediate vicinity. This arrangement of structures in association with the aguada is not unlike that noted for Aguada 1 (F79). In fact, the position of the two aguadas, equidistant from the main canal and located to the southeast and southwest of the intrasite area, further suggests the planned nature of the community. Nine small structures were plotted but not alidade mapped in the southern portion of the site due to time limitations. The area was mapped to better represent the zone outside the canal.

The Systematic Survey and Excavation Zone

The systematic survey and excavation zone was arbitrarily defined during the 1978 field season. The survey design allowed for comparable areal coverage both inside and outside the main canal. (See Table IV.) The

area inside the canal perimeter has been identified as the core zone. It is associated with a more densely occupied residential sector and major civic architecture. The area outside the canal perimeter has been defined as the periphery zone. It is understood to be a less densely occupied residential sector. (See Fig. 4.) Before discussing general trends between these two discrete portions of the site, a specific examination of the various components in the settlement will be made.

Inside the core area, 78 mounded features have been defined. Each of the various structure types are located within the canal perimeter. The overall plan of the core zone reveals a planned symmetry to the community. The main canal circumscribes the community, forming a great arc with its focus at the central precinct. The canal system has been treated in another section but raised fields do appear within the core zone. A medial axis runs north/south, through the middle of the site, bisecting the north/south axes of both ballcourts, terminating in the north at the foot of Structure 5C and dividing the main canal into two nearly equal segments. Complimenting this division of the core zone is the western orientation of Structure 29. An east/west line from the summit of this structure intersects the medial site axis at a point equidistant between the two ballcourt alleyways. In addition, the two end superstructures at the summit of Structure 29B appear to be facing

Structure 65 to the north and Structure 53 to the south, respectively. These two structures are equidistance to the summit of Structure 29B and they are positioned north/south of one another. (See Fig. 13.)

Many of the structures in the core zone are oriented toward the central precinct. This radial pattern of orientation directed toward the major monumental construction at the site further suggests the planned order of the community during the Tulix phase. The base map demonstrates the shared orientation of Structures 13, 14, 15, 16 and the 10 Group within the west/central portion of the core zone. The structures have the same orientation, apparently towards the center. Structure 19 in the western portion of the core zone may exhibit a tendency toward this radial orientation. In the eastern portion of the core zone only the small Structure 34, which was horizontally exposed, can be shown to manifest this orientation toward the center. The mounds in this area are generally isolated and more difficult to orient. This orientation to the central precinct must be more pronounced than our base map indicates. As a matter of convention, we always oriented the structures to north unless other information suggested differently.

The vacant area in the eastern portion of the core zone is primarily depressed thornbush and hulubol. This area has not been as closely examined as some other

areas which were more frequently walked across because of their proximity to camp and major field operations. It will be studied intensively during the 1981 field season, as the contour lines and vegetation distribution suggest a raised field platform complex in proximity to the main canal. Ground level occupation may also be present (see Ch. II).

The eastern coastal margin of the site may provide some evidence for maritime exchange with the presence of a dock-like facility at Structure 112. Structures 111, 113 and 114 rest in and at the margins of the _hulubol_. They appear to be house mounds using the principle of abundance. Two chultuns, or infilled wells, lie immediately between Structures 113 and 114. Structures 34-36 represent small house mound structures which are associated with two chultuns and a possible _sascabera_. They rest in a drained _huamil_ setting. Structure 37 appears to be a limestone construction fill stockpile not unlike the chert stockpiles reported at Becan (Thomas 1974). Structures 30 and 90 also rest within the _huamil_. Both structures are understood to be houses, although Structure 90 lies at the termination of _Sacbe_ 2 (Feature 51). Finds exposed by a windfall at the northwest side of Structure 90 suggest a Late Preclassic date for this mound, although it has not been considered in

our population estimates. The above structures appear to be drained by two channels issuing into the main canal.

Structures 39-41 represent a discrete cluster of house mounds perhaps associated with a shared ground level plaza. Structures 42-44 share a similar cluster configuration. These two groups are flanked by drainage channels. Structure 45 lies in the hulubol and is understood to be a house mound. The causeway across the main canal, in proximity to Structure 44, appears to represent one of the major thoroughfares into the interior of the bight from the core zone. Structures 46, 93, and 76 Group and the associated small structures at the 76 Group locus appear to have been linked to the center by way of this causeway. The occupants on Structure 44 may have played an important role in regulating the traffic over this bridge. Another causeway (Feature 121) 120 m. west/southwest of the first mentioned causeway was identified, but the absence of visible occupation to regulate and control access into the center may indicate that it dates to a period following the Late Preclassic florescence at Cerros.

Structure 29 is the most imposing structure in the core area. Structure 29B is drained on its east and south sides by at least three channels running into the main canal. The vacant area to the south of Structure 29 is understood to be a paved ground level plaza area,

associated with both the ballcourt Structure 50 Group and Structure 29. The north and west plaza exposures of Structure 29 appear to drain into the large catchment reservoir defined by the depressed thorn scrub and zacatal. Resting just off the medial plaza axis of Structure 29A are two low stone alignments thought to be associated with the Late Postclassic occupation of the site (Freidel, personal communication). A linear east/west trenching mound lies near the foot of Structure 29B and a circle of stone rests immediately to the west of it. The plaza appears to step down at its western extension before terminating at the 100.0 m. contour interval. Small structures 52 and 124 rest on this extension. Judging from their location and very small dimensions, they are suggested to be shrine loci. It should be noted that the single level platform with a pyramidal structure at one end appears in a Late Preclassic context at both Komchen (Andrews V n.d.) and Cuello (Scarborough in Hammond 1979). In addition, the westward orientation of Structure 29 without a balancing eastern structure is a recurrent pattern during the Cauac phase on the North Acropolis at Tikal (Coe 1965).

Running northeast from the upper corner of the plaza edge is Sacbe 2 (Feature 51). Structures 69, 59, 71 and 57 represent possible shrine loci along the course of this less well defined processional road. The

functional identification of these mounded structures can only be seen as tentative given the paucity of remains. The _sacbe_ was well defined along its western margin but poorly defined on its eastern flank. It should be noted that Komchen has a similarly oriented _sacbe_ also dating to the Late Preclassic period (Andrews V n.d.).

Structures 54 and 90 define the termination of _Sacbe_ 2. Structure 54 is a large multitier structure oriented north/south. It rests on a slightly elevated caprock bench with Structures 32, 38, 77, 105, 106, 107, 108 and 110. With the exception of Structures 54 and 105, all of these structures are presumed to be house mounds and ancillary structures associated with domestic activities. Structure 107 is associated with a well or chultun. Structure 105 appears to be another stone construction fill stockpile. This caprock bench area is understood to be one of the last islands of caprock within the core zone that was not stripped or quarried away for monument fill and drainage control. The 100.5 m. contour line interval is understood to have been the original ground elevation prior to quarry activities. The planned nature of the site is further suggested by the presence of this unquarried caprock bench in proximity to the central precinct. Quarrying was apparently first initiated some distance outside the central precinct in spite of the restrictive transport costs.

Structures 68, 75, and 81 appear to be house mounds associated with a ground level plaza. However, this portion of the site has been affected by recent landscaping attempts which have modified the original appearance of the terrain. Structures 72, 73 and 74 represent another house mound group probably associated with a ground level plaza. This area is well drained but appears to have received the major runoff volume from the central precinct. These two groups may have been involved in the channeling of this runoff away from the central precinct.

Structure 66 is surrounded by a complicated system of channels and depressions. These channels appear to eventually drain into the internal catchment basin located in the southwestern portion of the core zone. Structures 67, 25, 26, 27 and 28 occupy a similar setting to the west and southwest on relatively elevated ground. These structures are considered house mounds. A substantial amount of recent landscaping has occurred in this area. Its most pronounced effects are found in the depressed area between Structures 25-28 and the ballcourt Structure 50 Group. This area has been badly disturbed and may represent the remains of a small mound cluster. We cannot further comment on the original appearance of this group, considering their present appearance.

The two ballcourts, Structure 61 Group and Structure 50 Group, rest on elevated and well drained settings. The Structure 50 Group is drained on its eastern and southern flank by the main canal and to the north and east by the main catchment reservoir. The Structure 61 Group appears to drain indirectly into the main catchment basin via the southern and eastern sides of the structure. Structure 53 is nearly surrounded by the main reservoir and Structure 65 together with the small Structure 120 are nearly circumscribed by the drainage into the central depression.

The catchment basin area is divided by the northwest/southeast trending _Sacbe_ 1 (Feature 126). The area of this depression is 3.75 hectares as defined by the 99.5 m. contour line. Structures 18 and 95 rest at the margins of the depression and are understood to be house mounds. No structures are found within the depression with the exception of the _sacbe_ and the small Structure 17 located at the northern terminus of the _sacbe_. However, the deflated and eroded earthen platforms defined as raised fields rest inside the margin of this depression. The role of the _sacbe_ as a dike in directing the flow of runoff across the site must also be considered, although more information must be collected before further discussion of the actual dynamics of this hydrology.

The *sacbe* connected the Structure 50 Group ballcourt with the subplaza Structure 9A and associated structures. This link across the main depression or catchment basin completed a civic or ceremonial circuit through the core zone over controlled access plaza space. Clockwise, the circuit was initiated in the central precinct and crossed over the caprock bench to Structure 54. It proceeded along Sacbe 2 (Feature 51) to the *sacbe's* termination on the plaza Structure 29A and the foot of the elaborate Structure 29B. The pavement between Structures 29 and the 50 Group directed traffic towards the ballcourt. *Sacbe* 1 permitted the completion of the circuit across the *zacatal* depression onto Structure 9A and back into the central precinct. (See Fig. 10.)

Structures 13, 14, 15, 16 and the Structure 10 Group represent a complex of very large and complicated mounds at the end of *Sacbe* 1 (Feature 126). They rest on plaza Structure 9A and appear to be civic architecture with the exception of Structures 15 and 16 which are house mound loci. Their shared orientation has been commented on repeatedly and may reflect a radial attraction to the central precinct. Structures 12 and 24 rest at the edge of plaza Structure 9A and may be service quarters. Structure 22 rests on an earthen extension of the plaza and appears to be a small house mound locus.

Structure 9B defines the southern limits of the central precinct. It marks the northern extent of the lower southern portion of subplaza 9A. It is drained of runoff at its southeastern edge.

The Structure 11 Group is isolated from other structures and plaza space. It rests on unquarried high ground within the 100.5 m. contour interval. This courtyard group appears to be an elite residence. The presence of Structure 11B on the east side of the plazuela may have significance for the origin of Classic period residential shrine/oratory structures (Becker 1971).

Structures 96, 97, 98 and the 19 Group are located on an extensive tract of unquarried high ground. This 1.48 hectare unit has been disturbed by heavy equipment landscaping operations, but most of the mounds appear to be intact. Structure 19C has been severely altered, however (see Structure Excavations). Structures 96, 97 and 98 are argued to be house mounds. The Structure 19 Group appears to be a very large civic platform. Structure 19B especially resembles the storage platforms described for the Late Postclassic period (Rathje and Phillips 1975). Perhaps the entire caprock bench area was used as dry storage with special surplus stored on the raised platforms.

Structure 29 is bounded by a fork in the main canal. Its imposing position at the western end of the

canal would suggest its function as a sentinel in regulating traffic into the site. Head gates controlling flow from the New River could have been located in this area but no empirical evience has been revealed. The structure appears to have had a civic function.

Four additional causeways bridging the main canal must be noted in the southwest and western margins of the core site zone. The two to the west permitted traffic from the densely populated western periphery zone. They are poorly defined as a consequence of the recent landscaping operations in this portion of the site. The two others may be associated with Early Classic reuse as discussed in the Physical Environment Chapter (also see Ch. VI).

The periphery zone was defined by the 35 hectares outside the canal. The margins of the survey area were determined during the 1978 field season. It was to include the large complex of mounded features associated with the Structure 76 Group as well as a 200 m. survey zone immediately outside the main canal in all directions. Time limitations did not permit the examination of this entire area until the following year. However, an area comparable to that inside the canal was surveyed outside the canal during the 1978 season.

The great tract of land to the east of the canal and defined by the 100.5 m. contour line encompasses

an area of 22.9 hectares (including the 7.5 hectare area outside the systematically surveyed zone which was estimated from aerial photographic coverage). This area is extremely depressed and poorly drained. However, its proximity to the center and the canal system suggests that raised field agriculture may have been carried out in this area. The area has been systematically examined for structures, but carefully controlled survey with an eye open for agricultural plots has not been undertaken. Given the degree of siltation and plant disturbances over the last 2000 years, it is not surprising that we have not yet identified field loci. It should be recalled that the present surface relief manifested by the fields we have identified inside the canal is approximately 20 cms. Because our survey contour interval has been routinely 50 cms., identification of fields and minor feeder canals may have been masked. The SAR does suggest a concentration of alignments in this area of the site, adding further support to this hypothesis. The dotted canal segment running northwest/southeast through the hulubol may be a canal segment connecting the main canal with Aguada 1 (Feature 79). It is very poorly defined.

The two plazuela groups located in the northeastern portion of the intersite zone appear to be typical house mound groups (Structures 115 and 116 Group). The position of each within the hulubol suggests a role in

field maintenance. A problematic mound to the immediate west of the Structure 116 Group may be a raised field platform.

The positions of Structures 46, 93 and the 76 Group locus may reflect the location of a prehistoric trail leading from Structure 44 and the causeway crossing at Feature 161 to the interior of the bight. The Aguada 1 (Feature 79) appears to have been the focus of activities for Structures 78, 80, 82, 84, 85, 86, 87, 88 and the 76 Group. The form of Structures 82 and 88 with their extended plaza aprons is unique in the settlement. Most of the structures are very small and are viewed as domestic facilities. However, the imposing Structure 76 Group is a civic facility apparently providing cohesion to this small hamlet. The position of this monumental landmark, midway between the large Aguada 2 (Feature 154) and the core site zone, may suggest its role as a way station or traffic control plant.

Structures 94, 99, 100, 101, 102 and 103 are believed to be household loci in proximity to the canal. Ground level structures are thought to have been interspersed between these dwellings. However, little empirical evidence can be drawn upon, except for a few scattered sherd collections.

A Settlement Model

Our excavation within the systematic survey and excavation zone permit the discussion of developmental trends at Cerros following the initial occupation of the site during the Ixtabai phase (see Environmental Model). During the Co'h phase, there was a substantial amount of residence construction, but very little civic architecture was erected. Most of the monumental architecture dating at this phase apparently underlies the present central precinct (Cliff, personal communication). Inside the area defined by the canal, eight of the structures excavated were constructed during the Co'h phase and appear to be house mounds, with the possible exception of Structure 53. Approximately 47% of all residential construction (mounds) inside the canal during all periods was erected in the Co'h phase. No residential construction can be demonstrated outside the canal. (See Tables IV and V and Fig. 9.)

Civil architecture was less developed than during the later Tulix phase. Only one excavated monumental structure, Structure 76A, B and C can be associated with the Co'h phase. This structure lies outside the core site area at a location midway between the main Aguada 2 (Feature 154) and the core zone. As mentioned before, this location may have played a role in linking early Co'h phase and perhaps even Ixtabai occupation between

TABLE IV

CIVIC AND RESIDENTIAL CONSTRUCTION AND OCCUPATION FREQUENCIES THROUGH TIME

AREA COUNT	Co'h		Tulix		Early Classic		Late Postclassic	
AREA COUNTS								
Total Mound & Plaza Construction (41)	9[a]*	22%	24[b]	59%*	4	10%*	4	10%*
Total Mound & Plaza Occupation (41)	7	17%	11	27%	16[c]	39%	28	68%
Civic Mounds & Plaza Construction (20)	1	5%	18	90%	1	5$	0	
Civic Mounds & Plaza Occupation (20) (plazuela plaza not included)	0		2 (converted)	10%	0		0	
Civic Construction Inside Canal (18)	0		17	94%	1	6%	0	
Civic Construction Outside Canal (2)	1	50%	1	50%	0		0	
Residence Construction Inside Canal (15)	8	53%	4[c]	27%	0		3	20%
Residence Construction Outside Canal (6)	0		2	33%	3	50%	1	17%
TOTAL								
Residence Occupation Inside Canal (34/83%)	13	38%	12[c]	35%	14[c]	41%	24	71%
Residence Occupation Outside Canal (7/17%)	2	29%	3	43%	5	71%	6	86%

[a]Canal present but not included in count. [c]Fields present but not included in count.
[b]Canal and fields present but not included in count.
*Occupation percentages need not add up to 100% due to the reoccupation of mounds through time.

TABLE IV (Continued)

AREA COUNT	Co'h		Tulix		Early Classic		Late Postclassic	
MOUND COUNTS								
Total Mound & Plaza Construction (61)	10[a]	16%	40[b]	66%	7	11%	4	7%
Total Mound & Plaza Occupation (61)	13	21%	12	20%	22	36%	42	69%
Combined Totals		38%		85%		48%		75%
Civic Mounds & Plaza Construction (32)	2	6%	27	84%	3	9%	0	
Civic Mounds & Plaza Occupation (32)	0		3	9%	0	1	3%	
			(converted)					
Civic Construction Inside Canal (29)	0		26	90%	3	10%	0	
Civic Construction Outside Canal (3)	2	64%	1	33%	0		0	
Residence Construction Inside Canal (17)	8	47%	6	35%	0		3	18%
Residence Construction Outside Canal (12)	0		7	58%	4	33%	1	8%
TOTAL								
Residence Occupation Inside Canal (46/75%)	14	30%	16[c]	35%	20[c]	43%	32	70%
Residence Occupation Outside Canal (15/25%)	7	47%	9	60%	6	40%	14	93%

[a]Canal present but not included in count.
[b]Canal and fields present but not included in count.
[c]Fields present but not included in count.

TABLE V

CIVIC AND RESIDENTIAL DENSITY FIGURES THROUGH TIME

AREA COUNT	Co'h		Tulix		Early Classic		Late Postclassic	
AREA COUNTS		*		*		*		*
Total Mound & Plaza Construction (87)	19	.28	51	.74	9	.13	9	.13
Total Mound & Plaza Occupation (87)	15	.22	23	.33	34	.49	59	.86
Combined Totals		.49		1.07		.62		.99
Civic Mounds & Plaza Constructions (19)	1		17		1		0	
Civic Mounds & Plaza Construction (19)	0		2		0		0	
Civic Construction Inside Canal (18)	0		17	1	0			
Civic Construction Outside Canal (1)	1		1		0		0	
Residence Construction Inside Canal (50)	27	.79	14	.14	0		10	.29
Residence Construction Outside Canal (18)	0		6	.17	9	.26	3	.09
TOTAL								
Residence Occupation Inside Canal (72)	27	.79	25	.34	30	.88	51	1.50
Residence Occupation Outside Canal (15)	4	.11	6	.17	11	.31	13	.37

*Density = count/hectare.

TABLE V (Continued)

AREA COUNT	Co'h		Tulix		Early Classic		Late Postclassic	
MOUND COUNTS		*		*		*		*
Total Mound & Plaza Construction (105)	17	.25	69	1.00	12	.17	7	.10
Total Mound & Plaza Occupation (105)	22	.32	21	.30	38	.55	72	1.04
Combined Totals		.57		1.30		.72		1.14
Civic Mounds & Plaza Construction (28)	2		24		3		0	
Civic Mounds & Plaza Occupation (28)	0		3		0		1	
Civic Construction Inside Canal (25)	0		23		3		0	
Civic Construction Outside Canal (3)	2		1		0		0	
Residence Construction Inside Canal (53)	25	.74	19	.56	0		10	.29
Residence Construction Outside Canal (24)	0		14	.40	8	.23	1	.03
TOTAL								
Residence Occupation Inside Canal (79)	24	.17	28	.82	34	1.00	55	1.62
Residence Occupation Outside Canal (26)	12	.34	16	.46	10	.28	24	.69

*Density = count/hectare.

TABLE VI

NUMBER OF AREAS AND MOUNDS EXCAVATED IN THE SETTLEMENT

	Inside		Outside		
	Civic	Residential	Civic	Residential	Total
Total Number of Areas Excavated	18	15	2	6	41
Total Number of Mounds Excavated	29	17	3	12	49
Total Number of Areas <u>Visible</u>	18	50	1	18	87
Total Number of Mounds <u>Visible</u>	25	53	3	24	105
Total Surface Area in Hectares	34 (excluding center)		35		69

these two areas. The dynamics of this interaction are poorly understood.

The construction of the main canal was probably initiated during the latter portion of the Co'h phase. It was probably constructed for drainage purposes with the bulk of the fill being used in the construction of the civic and residential space inside the canal. However, a defensive posture for the community, as reflected by a ditch, cannot be dismissed at this early date.

General occupation of the site can be argued to have been quite substantial. Occupation loci for the Co'h phase have been defined as sherd concentrations located in or below mounded features. They may reflect mixed lots but probably indicate a ground level occupation in proximity. Thirty-eight percent of the known occupation "area" space inside the canal during all periods was utilized during the Co'h phase. Outside the canal, 29% of the known occupation space was employed.

An infield/outfield agricultural adaptation is posited, although maritime exchange and subsistence may account for the continued attraction to the central precinct. An intensive agricultural scheme may have been practiced to the east of the core zone.

The Tulix phase occupation of the site represents the period of major civic construction at the site. Nearly all the monumental architecture visible at the

site can be shown to date to this phase. It is concentrated within the area defined by the main canal. At least 90% of all civic construction inside the canal for all periods dates to this phase. In addition, Structure 53 was reused as a civic construction, given the planned symmetry at the site. Outside the canal, the only civic construction was Structure 76D which was added to the Structure 76 Group, suggesting the overall reuse of this Structure Group during this period. (See Tables IV and V and Fig. 10.)

All of this grand construction corresponds to the quarrying activities associated with the catchment system outlined in the environmental sections. The main canal is thought to have been widened and dredged at some locations (see Structure 98). The core area raised field platforms were constructed as well. In addition to the civic construction, some residential construction was carried out inside the canal. However, only 35% of the total mound residential "area" space inside the canal during all periods was constructed and occupied during the Tulix phase. Approximately 60% of all constructed and occupied mound residential space during all periods was done outside the canal perimeter. This suggests that the core site area was civic and administrative space and not simply residential space.

The density of mound occupation during the Tulix phase inside the area defined by the canal was 82 mounds/km., indicating the site was not a vacant ceremonial center. The mound density outside the main canal was 46 mounds/km., suggesting the dispersed compact model for the settlement during the Late Preclassic florescence. Even if the entire systematic survey area outside the canal is figured into our total (having an overall density of 75 mounds/km.), only a figure of 45 mounds/kilometer can be derived from a Tulix context, given the 60% occupation total for this phase. It should be noted that the *bajo* area has not been subtracted from our density figures because occupation in the *hulubol* does occur with some frequency.

Although our systematic survey and excavation area was defined during the 1978 season, our more recent survey and reconnaissance has revealed a sizeable concentration of mounded features resting to the southwest of the core area. The mound density of this area west of an arbitrary north/south trending line from the Structure 146 Group to the canal is 123 mounds/km. (the nearest mound east of the Structure 146 Group lies 240 m. away suggesting a less arbitrary division to this area). If 60% of these mounds were occupied during the Late Preclassic as has been indicated by our sample outside the canal in the systematic survey and excavation area, then a 74 mounds/km.

occupation density is suggested. This area indicates that the density drop-off outside the main canal was not significant along the coastline and in proximity to the New River, although a density decrease is indicated as one approaches the first river terrace. This concentration of occupation may suggest an adaptation to a riverine and maritime exchange with the service population engaged in petty exchange along the shoreline.

Our two transect lines to the south into the interior of the bight indicate a density figure much lower than that provided by the periphery zone, as defined by the systematic survey and excavation area. A total density of 26 mounds/km. converts to 16 mounds/ km. during the Tulix occupation. A clear density drop-off into the interior is indicated.

The mound density drop-off outside the canal corresponds best to our understanding of the centralizing forces at work at a Maya center. Local and regional exchange systems would have been coordinated and found to converge at the center. However, less supervised exchange and information flow would have entered the community along the western shoreline, making settlement at this location advantageous to the subordinate service class. The production of agricultural products outside the canal for internal or external consumption is suggested by the potential raised field area defined by the eastern hulubol.

Maintenance requirements may have been quite low, permitting reduced populations in the immediate vicinity of the field plots. (See Serpenti 1965; Heider 1970; Waddell 1972 for ethnographic energy expenditures in similar depressed agricultural areas.)

The Early Classic occupation at Cerros is defined by only one civic monument. The bulk of the Structure 10 Group appears to have been constructed during this period. The general mound and plaza construction dropped to 10% of the total construction for all periods at the site. However, a sizeable residental reoccupation was maintained at Cerros, attaining a density figure inside the canal of 100 mounds/km. All of this occupation represents a reoccupation of former civic construction and house mound loci constructed principally during the Tulix phase. The area outside the canal was much lower (29 mounds/km.) but did see the construction of four new house mounds. Although the main canal appears not to have functioned as a major drainage device, it was modified to collect small reservoirs of water (see Operation 116). Sections of the canal were bridged by causeways or dams, suggesting that the original canal was an impediment to foot traffic. (See Tables IV and V and Fig. 11.)

These data suggest that the site was not abandoned following the Tulix phase occupation. Rather a reorientation to a different land base is suggested. Although the

overall population only slightly decreased, the adaptation made to the land base appears to have been significantly altered. This Early Classic adaptation is thought to be more in line with the infield/outfield adaptation made during the Co'h phase, although raised field agriculture may have continued in the immediate vicinity of the core area. The Early Classic adaptation may have included raised fields inside the community limits, but the elaborate hydrology of the Tulix phase was certainly beyond their organizational interests. Local exchange may have continued to support the dense residential population inside the canal, but agriculture must have been the major subsistence mode. The attraction of the community to the Tulix phase ruins may have been their functional advantage in terms of elevated ground in proximity to the shoreline, as well as the former beauty and glory of the site. It is not difficult to imagine the abandonment of the site by a managerial elite during the Tulix phase, with the service population and their descendents readapting to a new less structured order.

Cerros is virtually abandoned during the Late Classic period. A cist containing some Terminal Classic trash was exposed on Structure 50E of the ballcourt group, but little additional evidence for occupation was suggested. The abandonment of the site during the Early Classic period is not well understood. Arguments

suggesting that exchange networks and political associations circumvented Lowry's Bight can be easily posited, but no empirically grounded arguments can be marshalled to support or deny such a hypothesis. (See Conclusions.)

Arguing from our local information base, it may be said that the Early Classic period occupation of the core zone was rather brief and initiated by the former service population to perhaps revitalize the fallen Tulix center. (Ceramic analyis for this period has not progressed far enough to clearly assess the length of time Early Classic occupation may have continued at Cerros.) Such an effort would have emphasized the maintenance of the subsistence system to support the local population. However, with the abandonment of the center by the elites and the loss of centralized authority, the civic architecture would have eroded into disrepair. The canal network would have undergone sedimentation and the general water catchment scheme would have failed. The environmental setting probably would revert to a condition not unlike that found at the site today (see Fig. 3) making the site nearly uninhabitable. Major reoccupation at the site would have required a considerable energy investment. Such an investment was never realized again.

The Late Postclassic occupation at Cerros may span a greater period of time than the other phases described. Although this factor may have somewhat

inflated the density estimates, these figures appear to indicate the same general trends as revealed by the Early Classic occupation. (See Tables IV and V.) The settlement configuration during this period probably reflects less any Postclassic spatial relationship than a simple selection for available high ground. (See Fig. 12.) The site setting was probably similar to its present condition, although bush trails and cleared plaza space were probably the rule. No civic construction was carried out at any location in the settlement. However, three house mounds appear to have been constructed. Most of the monumental architecture appears to have been reoccupied with an especially dense midden deposit located at the foot of Structure 9B. Because the main canal was probably not utilized in any manner, density figures inside and outside are less meaningful. An overall density of reoccupation in the systematic survey and excavation settlement area indicates a very high figure of 114 mounds/km. The adaptation made by these occupants is difficult to assess, but a variation of the "merchant pragmatism" model (Sabloff and Rathje 1975) may be suggested by the limited architectural investment. (See Harrison 1979 for similar architectural adaptation in Quintana Roo.) Some rather generous Late Postclassic caches have been recovered from the larger monumental architecture, perhaps reflecting this materialism.

The population density at Cerros during the Late Postclassic period is somewhat puzzling. It may be related to the growth and dominance of Santa Rita just 3 km. across the bay (Chase and Chase n.d.). The dynamics at work are poorly understood.

A growth model through time hardly seems appropriate for Cerros. Such a model may be appropriate for the region but little systematic data can be brought to bear on the subject from the confines of Lowry's Bight. The Co'h phase developed into a Tulix phase, and the Early Classic showed reoccupation of the abandoned center. However, the nearly complete absence of Late Classic debris at the site strongly suggests that the Early Classic adaptation was not a successful one. An attempt to maintain Late Preclassic traditions, given the new social order, probably spelled the demise of the group. The absence of later Classic period occupations may be a consequence of environmental factors contributed to by the infilling of the cultural relief. Although the geographically commanding position of Cerros was not altered, the energy necessary to revitalize the drainage systems was extremely costly. It was not until the Late Postclassic period and the materialistic trading colonies of the Yucatan coast, that the geographic position and an immediate economic return outweighed the physical unpleasantness of the Cerros environs.

CHAPTER VIII

LATE PRECLASSIC PERIOD COMPARISONS AND CONCLUSIONS

Comparisons with Late Classic and Postclassic communities are unavoidable, given the paucity of recorded Late Preclassic settlement data. However, such comparisons might be considered as poorly controlled ethnographic analogy, containing an indeterminable degree of temporal continuity. The structure density information provided below is derived primarily from those sites which have documented Late Preclassic activity. The interpretation of these data aid in placing Cerros in the proper temporal perspective. Moreover, they indicate the variety of spatial adaptations made by the Maya and they reflect their regional dynamics at an early date.

The Cerros Tulix phase (50 B.C.-A.D. 150) mound density figures are comparable to Late Preclassic concentrations elsewhere. Within the systematically surveyed area surrounding the central precinct approximately 150 people resided inside the core area or canal perimeter (82 structures/km^2) and 291 people resided outside (45 structures/km^2) (using a figure of 5.4 people/mound after Puleston 1973). Given the mound density drop off into the interior (16 structures/km^2), a conservative

sustaining population of 1140 people is estimated for Lowry's Bight. (Lowry's Bight has an area of 9.63 km^2, of which 16% has been systematically surveyed.)

Puleston estimates a Late Preclassic Tikaleno population of 8230 people from within a ring encompassing 32 km^2 (1973:223). Although the Cerros population is considerably smaller than that of Tikal, the radius of Preclassic occupation in proximity (although outside the sustaining area of Lowry's Bight) goes well beyond the bight (see Reconnaissance). Even so, Tikal would appear to have had a larger and more densely occupied community at a comparable period. It should be noted that Puleston's Late Preclassic intrasite area would have contained 3.8 km^2 with 215 structures/km^2. The structure density for all mounds, civic and residential, inside the canal perimeter at Cerros is 130 structures/km^2 (excluding the central precinct).

Cerros density figures are comparable to those generated by Rice and Rice (1980) at Lake Yaxha and Lake Sacnab which appear similar to the interior transect legs at Cerros. Their average Late Preclassic density figures for Lake Yaxha are 19.4 structures/km^2. This compares favorably to the 16 structures/km^2 obtained from our two interior systematic survey brechas on Lowry's Bight. However, in a transect operation approximately 500 m. west of the major organizational center of Yaxha, the

Rices record a structure density of 48.7 structures/km^2; a figure in keeping with the average systematic survey and excavation area outside the canal at Cerros (46 structures/km^2). These population data suggest that Yaxha was of the same order of magnitude as Cerros during the Late Preclassic. Tikal, on the other hand, was at least twice as large a population center as either Cerros or Yaxha.

Altar de Sacrificios appears to have a similar density of non-ceremonial structures as documented near Yaxha and immediately outside the core area at Cerros. During the Late Preclassic period (Plancha phase), 28 structures suggest occupation spread out over 66 hectares of settlement space (12 hectares of the site were excluded as central precinct space). A figure of 42 structures/km^2 is suggested by Bullard's map (Smith 1972; Willey and Smith 1969; Willey 1973). This figure may reflect the type of settlement aggregate attracted to organizational centers during the Late Preclassic period. It does suggest that the size of Altar de Sacrificios was less than that recorded at Cerros, given the absence of a comparable core zone density. This is further reflected in the overall area of the two communities as well. It should be noted that Altar de Sacrificios may have a larger mound population than Bullard's map indicates as

suggested by Puleston (n.d.) and forcefully stated by Becker (1977).

Barton Ramie reveals a specialized adaptation to the riverine setting along the Belize River. No major monumental construction lies in the immediate vicinity of the site, yet 262 structures have been identified within an arbitrarily defined 2 km. area. During the Floral Park phase (c. A.D. 1-200), 50 mounds of the 65 excavated were occupied (Willey et al. 1965). Although there may exist some sampling problems, if 77% of the 262 mounds were occupied at this time, then a density figure of 101 structures/km^2 is derived. This figure is considerably higher than most other Late Preclassic organizational centers that have been examined. It suggests that the site had made an immediate environmental adaptation rather than a political one. Given the proximity of raised field agriculture (Kirke 1980) and the commercial advantage of canoe traffic along the river, Barton Ramie and similar sites appear not to have invested their surplus in monuments at the immediate locus of the site.

Komchen lies approximately 19 km. south of the Gulf of Mexico in northwestern Yucatan. By the end of the Late Preclassic period (Xculul 1), Komchen covered about 2 km. with an approximate density of 450 structures/km^2 (Andrews V n.d.:7). Although preliminary analysis has only recently begun, the density of low

platform residences may suggest the presence of ground level "hidden" house mounds at other less visible sites, particularly to the south. Komchen has been suggested to be an adaptation to salt exploitation along the north coast (Freidel 1978; Andrews V n.d.). The extremely high population densities achieved at Komchen may reflect a centripetal force nucleating the sustaining population as a consequence of regulating the exploitation of the salt beds. The population density is seen as a site specific adaptation to a labor intensive economic mode. (This adaptation need not have been repeated for raised field agriculture, given the limited amount of actual work necessary to maintain such plots. See Wilken 1977.)

Another method of assessing the similarities and differences between known Late Preclassic communities is evaluating the amount of energy invested in their respective monuments. Although the amount and degree of craftsmanship required in the stucco molding of pyramids or the painting of friezes is difficult to assess, gross earth moving expenditures can be readly calculated. As with the structural density figures, I will contrast the various communities.

The total volume of Tulix phase (50 B.C.-A.D. 150) monumental construction inside the central precinct is 133,104 m^3 (excluding Structure 9). The total volume of Tulix phase monumental construction remaining inside the

canal perimeter is 61,218 m^3. These figures must be considered conservative because paved areas throughout the core area exist but are difficult to evaluate. We have made no attempt to include these areas in our volumetric study. Cerros civic monuments are distributed over 37 hectares inside the canal perimeter with frequent house mound loci interspersed.

Less is known about the monumental architecture of the Late Preclassic period at other Lowland Maya sites than at Cerros. Even so, some comparisons can be drawn with respect to the fill volume of monuments. These figures may be somewhat inflated as a consequence of including underlying structure fill dating to earlier periods, but in most cases they should be considered quite conservative, given the sampling problems resulting from later construction events.

The fill volume figures obtained from Tikal were taken from Coe (1965, 1967) and the Tikal Map (Carr and Hazard 1961). The North Acropolis at AD1 is 45 m. east/west by 40 m. north/south and 9 m. high. It attains a mass of 16,200 m^3, which is approximately one half that of Structure 4 at Cerros. The Lost World Pyramid, or Structure 5C-54, at Tikal is considered one of the largest Preclassic period monuments in the Maya area. It is 76 m. north/south by 62 m. east/west having an elevation of 30.5 m. (100 ft.). If the summit floor space is 16 m.

north/south by 9 m. east/west, then a fill volume figure of 74,054 m^3 is computed. This is more than twice the volume of the largest structure at Cerros, Structure 4. Culbert (1977) noted a 4 m. infilling operation in the Seven Temples plaza during the Late Preclassic period. The area of this plaza is 104 m. north/south by 76 m. east/west providing a fill volume figure of 31,616 m^3. This is equivalent to the volume of Structure 4 at Cerros.

Although the known Late Preclassic monuments indicate that Cerros and Tikal are comparable in size, the settlement density figures suggest Tikal to be considerably larger. The South Acropolis at Tikal is undated and the extent of Late Preclassic plaza space is unknown. Even still, Cerros and Tikal share many elements at this early date. The westward orientation of Structure 29 at Cerros without a balancing structure to the east appears initially in Cauac times (50 B.C.-A.D. 150) on the North Acropolis. Although Culbert (1977) suggests a Cimi phase date (A.D. 150-250) for the final center line orientaton at the North Acropolis, Coe (1965) suggests a Cauac date. A center line axis through the entire core zone community at Cerros occurs by the Tulix phase. Courtyards with temples first appear in the Cauac phase (Culbert 1977) at Tikal. Courtyard groups are not well established at Cerros, but do appear by the Tulix phase.

Perhaps one of the most interesting features suggested by the Cerros settlement data is the open character of the core area. This is readily apparent from the map and may reflect an ideal in Late Preclassic community organization. The residential population, in part, is distributed across the core area, unlike Maya centers in later periods where the residential population is generally segregated from the grand monumental architecture. Tikal may have had a similar plan during the Late Preclassic period, given the distance between the North Acropolis and Structure 5C-54. This distance is 500 m. which compares favorably to the distance at Cerros from the central precinct to the ballcourt Structure 50 Group. Residential space at Tikal may have been distributed between these structures and was later covered by civic plaza space and additional monumental architecture. It should be noted that Coe (1977) suggests that Olmec sites had an open appearance as well.

Other sites are less well documented during the Late Preclassic period due to later massive construction events. The amount of Late Preclassic monument fill at Yaxha is not known. At Altar de Sacrificios, Structure B-I Construction B dates to the later Plancha phase. It is approximately 37 m. north/south by 39 m. east/west having a height of 9 m. (Willey and Smith 1969; Willey 1973). The summit platform space is approximately 5 m.

north/south by 9 m. east/west. An earthen fill volume of 6696 m^3 is approximately two-thirds the fill volume of Structure 29B. No other Plancha phase civic architecture has been reported from Altar de Sacrificios, further suggesting its small size relative to Cerros. It should be noted that Altar de Sacrificios does have domestic occupation in the immediate vicinity of Structure B-I during the Plancha phase. This may reflect the open nature of the center at this early date.

The site of Becan, Campeche has revealed Late and Terminal Pakluum phase (100 B.C.-A.D. 250) monumental architecture. The most imposing feature at this site is the great ditch, or defensive earthworks, surrounding the site. It represents 117,607 m^3 of quarried fill (Webster 1976). Structure IV-sub is the only Late Preclassic structure of monumental dimensions. Using Potter's illustrations (Potter 1977; Ball and Andrews V 1978:11), the substructure is approximately 20 m. on each side and roughly 11 m. high (14 m. high on the north side and 8 m. high on the south). A rough substructure platform summit space has been calculated to be 120 m^2. These figures provide a fill volume figure of 2860 m^3. In addition, four small structures, perhaps house platforms, have been identified to this phase (Ball and Andrews V 1978; Ball 1977) suggesting the open arrangement between residential and civic monument space. The Becan example suggests

that some Late Preclassic communities defined clear limits to their centers, a characteristic also noted at Cerros. These figures suggest that Becan may have been an organizational center of the size and complexity of Cerros. Its defensive posture is believed to be an adaptation to its circumscribed position at the geographic center of the Yucatan Peninsula. Its adaptation is argued to be a localized phenomena.

The Late Preclassic Floral Park component at Barton Ramie is not identified with any large scale monumental architecture. Although Baking Pot (Ricketson 1931; Bullard and Bullard 1965) or Xunantunich (Thompson 1940) may have more substantial Late Preclssic architecture than presently documented, the sizeable Late Preclassic population at Barton Ramie suggests that population centers need not be equated with civic centers.

The Late Preclassic component at Komchen has been shown to be very substantial. However, a site map has not yet been published and volumetric calculations must be considered preliminary. By Xculul 1 (300 B.C.-A.D. 150), platform Structure 500 had attained a height of 2.5 m. and extended over an area 70 m. by 75 m. producing a fill volume of 13,125 m^3. A pyramidal structure, 30 m. by 30 m. and 3 m. high, rested on its south end and accounted for another 2700 m^3 of fill. Platform Structure 450 appears to have been 3.5 m. high and covered

an area of 1400 m^2 at this time. It had a fill volume of 4900 m^3. In addition, three other large platforms are reported at Komchen but volumetric calculations are difficult without additional data. At any rate, civic monuments do not appear to be as massive or elaborate as those defined at Cerros, Tikal and, perhaps, Becan. These Komchen data were taken from Andrews V (n.d.).

Other well documented Late Preclassic monumental architecture is reported at Altun Ha (Pendergast 1976, 1979), Lamanai (Loten n.d.), Cuello (Hammond 1979), Edzna (Matheny 1976), El Mirador (Matheny 1980) and Uaxactun (Ricketson and Ricketson 1937) but little has been reported on the Late Preclassic settlement pattern from these sites.

Although special local adaptations were made at each of these sites, Cerros does not seem unique by comparison. Tikal, Becan and perhaps Yaxha share similar formal characteristics. Altar de Sacrificios and Barton Ramie fit into the areal settlement system, although they are smaller communities. Komchen represents a different adaptation from those sites further to the south. It does not share the strong Chicanel interaction sphere tradition and appears to be more isolated in its development.

The above population density and volumetric figures suggest the various population aggregates

centralizing during the Late Preclassic period. With the exception of Barton Ramie, each site contains monumental architecture in a central precinct. However, preliminary comparison suggests that the highest concentration of residential population probably occupied an area immediately surrounding each central precinct. This pattern of dense house mound occupation inside the core area is later reversed at most Maya sites during the Classic period, though "palace" complexes may represent elite space (Harrison 1970; Adams 1974).

To explain these formal traits we have marshalled our arguments accordingly. One of the major adaptations made at Cerros was long-distance exchange (Freidel 1978, 1979). By definition, Cerros was not unusual in this adaptation. Tikal, Yaxha, Seibal, Lamanai and Becan were surely involved in similar exchange at this early date. The adaptations made by such densely settled communities as Barton Ramie and Komchen without substantial monumental architecture (perhaps Altar de Sacrificios should be included) suggest a less direct or intense involvement in the regional information flow. This type of site dichotomy may suggest an early adaptation to consortium representation.

This model suggests that sites like Barton Ramie and Komchen were densely occupied communities probably structured in a manner not unlike their Middle Preclassic

antecedents, although marked population growth had occurred. However, as a consequence of various factors including population growth and increased demand for locally scarce resources, greater communication and exchange was established. The most efficient exchange system followed well established geographical routes and if a site was not on that thoroughfare, or lacked the information or commodities in demand, it was surely by-passed. In order to "corner" or maintain a communication node in the exchange network, a site would have to control a range of information and merchandise attractive to other similar organizational centers.

Most Late Preclassic communities have Middle Preclassic period antecedents. These smaller villages probably exchanged goods and services in a symbiotic manner similar to that postulated for the Pacific coast of Guatemala (Flannery and Coe 1968). However, with the initiation of intensive agriculture these sedentary populations were capable of producing surplus capital. Surplus supplies could be stored or traded. It is suggested that stored surplus subsistence goods did not provide the necessary symbols for incipient stratification in a community. Village population would have been stable and well maintained at an established density within the subsistence storage limitations of the community. There would not have been a social or economic

mechanism for inducing population increase or stratification. It is with commerce, however, that surplus goods not in storage are exchanged for items and information which set individuals apart in society (see Flannery 1967). Intensive agriculture, specialization and population growth are suggested to have been developments from this condition (Fried 1967).

It is posited that small, although perhaps densely occupied, communities which may have developed specific economic resources and adaptations joined with other communities of perhaps different resource bases to form organizational and administrative centers of exchange. These centers would have been maintained, in large measure, by a local service population living at the center, but their construction and economic establishment would have required the allied support of the smaller site aggregates.

In order for the above communities to establish and support centers, mechanical adaptations were developed (Flannery 1972). A few Middle Preclassic communities rose to direct the volume of exchange through their centers, perhaps as a consequence of fortuitous geographic positions at the regional exchange level or due to local social and political decision making. At any rate, these organizational centers may have functioned as classic redistribution centers at the local level, but their interaction in regional exchange permitted the

introduction of scarce resources into the local economic systems. With a demand established at both ends for locally less abundant items, greater specialization evolved producing a continually dependent interaction between the local villages and the organizational center. It should be noted that agricultural products may have been items in demand at the intercenter level of exchange as well as unique craft specialties.

Cerros appears to have developed as a consequence of this exchange network, although it did not evolve from Middle Preclassic antecedents. Most Late Preclassic communities have Middle Preclassic manifestations, suggesting that Cerros was selected as an organizational center without prior history at the immediate site setting. Hammond (1977) has isolated 17 Late Preclassic sites in northern Belize, including Cerros. Each of these sites developed "ceremonial center" status by the Early Classic period, with the exception of Cerros and Kichpanha (a small site between Colha and San Estevan). Cerros appears to be the largest organizational center in northern Belize during the Late Preclassic period. Lamanai was probably the nearest large center, more than 80 km. up river from Cerros. This may suggest that the contributing local support population for the Cerros consortium was drawn from the minimum of 17 known Preclassic sites in northern Belize.

A disbandment of the Cerros consortium at the end of the Late Preclassic period would account for the abandonment of Cerros. Hammond (1977) reports an increase in size and number of Early Classic sites in northern Belize. Cerros is the only site which was not significantly occupied, with the exception of Kichpanha. It is suggested that following the abandonment of Cerros, due to internal local factionalism and/or regional disruptions in the information and exchange network, the individual support communities became more autonomous and independent of a single organizational center. These communities constructed small civic monuments to solidify their immediate populations, as well as to attract some outside exchange. Even so, such minor Early Classic centers in northern Belize would have permitted a poorly defined exchange network with few outside influences affecting their destinies. Population numbers probably remained stable or increased during this period, although elaborate organizational centers of the scale noted in the northeastern Peten were unable to receive the necessary support. The major exchange avenues probably by-passed most of northern Belize. Cerros was continually occupied at this time but by a population much less integrated and coordinated than during the Late Preclassic period. The catchment system was allowed to infill and fall into

disrepair. Once this occurred, the hydraulic system could not be reclaimed without tremendous effort.

It should be noted that the Floral Park distribution throughout northern Belize includes five key Late Preclassic sites (Pring 1976) thought to be involved with the Cerros consortium. In fact, a site such as Nohmul, with a substantial Late Preclassic component as well as a strong Floral Park manifestation (Hammond 1975), may have been a center for factionalism and consortium rivalry over the local Cerros redistribution network. This condition might reflect the distribution of Floral Park traits, traded in from the southern highlands. Nohmul may have redistributed its highland exotics and information to surrounding communities in exchange for their support and the exclusion of Cerros and its support communities. This introduction of new ideas and traits may have torn the consortium apart, with sites formerly allied to Cerros trading and reassessing their support in favor of the luxury wares and novel ideas circulating through Nohmul.

Robertson-Freidel (1980) has identified the appearance of Protoclassic occupation at Cerros. Although the Terminal Preclassic period (A.D. 150-250) is poorly identified at the site, the presence of Early Classic (Tzakol) occupation would suggest a continuous occupation rather than abandonment. Culbert (1977) makes a similar

assessment at Tikal in stating that "[t]he slight decline of Cimi occurrences is more likely due to differential ease of recognition of the complex than to actual population change" (p. 33).

The above competition does not seem to have affected Tikal and other northeastern Peten sites in the manner described for northern Belize. Tikal may have solidified its dominion with the aid of such sites as Uaxactun (16 km. to the north) and perhaps Yaxha (26 km. to the west/northwest). While Tikal centralized its power during the Manik (Early Classic) phase, other organizational centers, including Cerros, suffered setbacks. In the Pasion drainage, Altar de Sacrificios continued its growth into the Protoclassic and Early Classic during the Salinas phase (A.D. 150-450). Seibal, on the other hand, underwent a severe decline (Willey 1977). If Seibal were representative of a consortium seat in a manner similar to that described for Cerros, then its decline and subsequent abandonment in the Early Classic may be analogous to the situation in northern Belize. Although Altar de Sacrificios is more than 60 km. downstream, it may have represented a key site in the Late Preclassic Seibal consortium. The strong manifestation of Floral Park diagnostics at Altar de Sacrificios and their weak representation at Seibal may be

symptomatic of the type of factionalism which spelled the early demise of Cerros.

Generally, it seems that smaller sites endured economic and political power shifts better than larger sites (i.e. Altar de Sacrificios and Barton Ramie). This is not surprising given their local economic base and their distance from the most specialized and vulnerable regional exchange centers. Netting (1977), in relating the preference of agriculturalists, states:

> Though trade may eventually bring wealth, it seems to be in the first instance a final resort of the poor farmer whose preference for the security and independence of self sufficient agriculture remains clear. (p. 317)

The direct interaction of the agriculturalist to the subsistence base permitted a more stable community base than the heirarchically unstable organizational or administrative center (after Butzer 1980).

The above model is offered to clarify the information available to date. It must be considered in the realm of speculation, but it does fit the available data base. In closing, it should be stated that the above model lends itself to the recently considered concept of "disembeddedness" (Blanton 1976, 1978). Although the concept has been attacked from several positions (Willey 1979; Santley 1980), it does describe a community condition in which the major support population is not at the organizational center. Although it is unlikely that the

Maya were organized into various confederations as described for Monte Alban (Blanton 1978; Marcus 1980), a consortium agreement fits well at this early date.

APPENDICES

APPENDIX A

VOLUMETRICS AT CERROS

Quarry Volume

The contour map of Cerros has provided the data for this analysis. An assessment of ground contour depression volume, or removed quarry volume, involved computing the associated area between each of the contour lines. This figure was converted into a volume figure by multiplying it by the number of centimeters below the 100.5 m. contour line that the given area occurred. The 100.5 m. contour line was selected as the original surface height of the terrain in the intrasite area because it represents the highest natural ground at the site. The area between contour lines was computed using millimeter graph paper placed under the original Cerros environs map. The area was computed by counting the number of squares within each zone.

Although siltation has affected the terrain and contours at the site in the last 2000 years, most of these matrices are eroding from high ground in the immediate vicinity of the depressions. This is apparent from the very flat natural topography and suggests that our

volumetric comparisons of depressions to structures have still maintained volumetric comparability.

Karstic features at Cerros are not pronounced, although Aguada 2 is a sizeable feature. It occurs one kilometer from the central precinct near the center of the bight and may be related to some other geologic process. Within the core site area, as defined by the canal, no severe karst formations have been detected. This is supported by our volumetric studies from within the canal. In this vein, the poor correlation of mound fill with the volume of earth removed from the 100.5 m. contour circumscribing the site suggests that the area to the east of the main canal within the hulub bajo setting probably was not quarried for house mound or monument fill. The depressed condition of this area would suggest that the area was low before the initiation of occupation.

Calculated cubic meters of fill removed from Cerros, if the 100.5 m. contour circumscribing the core site area represents level and original land surface, are set forth in Table VII. These figures include the area underlying each structure.

Calculated cubic meters of fill underlying each structure subtracted from the depression volume is set forth in Table VIII. The fill underlying each structure is assumed not to have been removed during quarry activities as indicated by our excavation exposures.

TABLE VII

CALCULATED CUBIC METERS OF FILL REMOVED FROM CERROS WITHIN THE 100.5 M. CONTOUR LINE

Contours		Depression Area		Depression Volume
100.5 m-100.0 m	=	318,000 m^2	=	159,000 m^3
100.0 m- 99.5 m	=	83,200 m^2	=	83,200 m^3
99.5 m- 90.0 m	=	36,900 m^2	=	55,350 m^3
99.0 m- 98.5 m	=	600 m^2	=	1,200 m^3
*100.5 m-100.0 m	=	75,000 m^2	=	37,500 m^3
Total			=	317,800 m^3

*This figure was derived and estimated from aerial photographs only. It represents a portion of hulub bajo outside the systematically surveyed area to the east, but part of the contiguous 100.5 m. contour circumscribing the core site area.

TABLE VIII

CALCULATED CUBIC METERS OF FILL UNDERLYING EACH STRUCTURE SUBTRACTED FROM THE DEPRESSION VOLUME WITHIN THE 100.5 M. CONTOUR LINE

Contours		Depression Volume		Underlying Structure Volume		New Depression Volume
100.5 m-100.0 m	=	159,000 m^3	-	11,416 m^3	=	147,585 m^3
100.0 m- 99.5 m	=	83,200 m^3	-	1,196 m^3	=	82,004 m^3
99.5 m- 99.0 m	=	55,350 m^3	-	180 m^3	=	55,170 m^3
100.5 m-100.0 m*	=	37,500 m^3	-	0 m^3	=	37,500 m^3
New Total					=	322,259 m^3

*This figure was derived and estimated from aerial photographs only. It represents a portion of hulub bajo outside the systematically surveyed area to the east, but part of the contiguous 100.5 m. contour circumscribing the core site area.

Calculated cubic meters of structure fill volume within the systematically surveyed site area minus area of structure fill volume outside the 100.5 m. contour circumscribing the site:

$$\begin{array}{r} 226{,}395 \text{ m}^3 \\ \underline{-\ 13{,}175 \text{ m}^3} \\ 213{,}220 \text{ m}^3 \end{array}$$

Calculated fill difference between structure volume and depression volume:

$$\begin{array}{r} 322{,}259 \text{ m}^3 \\ \underline{-213{,}220 \text{ m}^3} \\ 109{,}039 \text{ m}^3 \end{array}$$

This latter total strongly suggests that a portion of the site was already depressed before quarrying operations occurred. However, if the area within the core site zone is only considered as potential quarried space, then a different set of conclusions may be drawn.

Calculated cubic meters of fill removed from Cerros, if the main canal defining the core site area represents level and original land surface, is set forth in Table IX. These figures include the area underlying each structure.

TABLE IX

CALCULATED CUBIC METERS OF FILL REMOVED FROM CERROS WITHIN THE CORE AREA

Contours		Depression Area		Depression Volume
100.5 m-100.0 m	=	151,200 m^2	=	75,600 m^3
100.0 m- 99.5 m	=	71,200 m^2	=	71,200 m^3
99.5 m- 90.0 m	=	36,900 m^2	=	55,350 m^3
99.0 m- 98.5 m	=	600 m^2	=	1,200 m^3
Total			=	203,350 m^3

Calculated cubic meters of fill underlying each structure subtracted from the depression volume is set forth in Table X. The fill underlying each structure is assumed not to have been removed during quarry activities as indicated by our excavation exposures.

Calculated cubic meters of structure fill volume within the area of the 100.5 m. contour circumscribing the site minus the area of structure fill volume outside main canal:

$$\begin{array}{r} 213{,}220\ m^3 \\ -\underline{\quad 2{,}234\ m^3} \\ 210{,}986\ m^3 \end{array}$$

Calculated fill difference between structure volume and depression volume:

$$\begin{array}{r} 210{,}986\ m^3 \\ -\underline{189{,}451\ m^3} \\ 21{,}535\ m^3 \end{array}$$

This figure is more compatible with our understanding of the limits of the immediate site area. The additional mound fill for the construction of the monuments within the core site area would appear to have been quarried from the margins of the canal, given the proximity of the rest of the fill.

TABLE X

CALCULATED CUBIC METERS OF FILL UNDERLYING EACH STRUCTURE SUBTRACTED FROM THE DEPRESSION VOLUME WITHIN THE CORE AREA

Contours	Depression Volume		Underlying Structure Volume		New Depression Volume
100.5 m-100.0 m =	75,600 m^3	-	11,323 m^3	=	64,277 m^3
100.0 m- 99.5 m =	71,200 m^3	-	1,196 m^3	=	70,004 m^3
99.5 m- 99.0 m =	55,350 m^3	-	180 m^3	=	55,170 m^3
Total					189,451 m^3

<u>Structure Dimension Data</u>

The mound volume data were derived from our 1:50 or better alidade and plane table maps. The mounds were viewed as truncated pyramidal forms for the purposes of this analysis. The length and width of the summit surface space for the structures was taken from the contour maps and has been referred to in the dissertation as potential platform summit space. It has been provided to better describe the mound form.

The formula finally employed after some experimentation was:

$$\frac{(B_L \times B_W \times h) - (T_L \times T_W \times h)}{2} + (T_L \times T_W \times h) = V$$

where: B_L = Base Length
B_W = Base Width
h = Height
T_L = Top (Summit) Length
T_W = Top (Summit) Width
V = Volume

Table XI also includes distance relationships between mounds for further spatial studies. These data are included because of the more precise, large scale maps available to the author. Although all of our observations concerning horizontal spatial relationships across the site have been through visual inspection, statistically quantifiable conclusions may be drawn from these data.

TABLE XI

CERROS SETTLEMENT VOLUMETRIC DATA

Key

h	height
Bw	width at base
Bl	length at base
Tw	width at top
Tl	length at top
Dist.A	distance to center, in meters
Dist.B	distance to Structure 29, in meters
Dist.C	distance to nearest neighbor, in meters
Dist.D	distance to nearest second neighbor, in meters
Area	area at base

*These structures (2A-8D, 23) are in the central precinct and subplaza height was excluded in all calculations. Plaza height is included in calculations for all other structures.

[a]Excavated Structure.

[b]Data for 2A includes 5A.

[c]Structure is located within systematic survey area.

[d]Disturbed.

[e]Unmapped.

TABLE XI (Continued)

Structure		h	Bw	Bl	Tw	Tl	Dist.A	Dist.B	Dist.C	Dist.D	Area	Type	Volume
ab	2A	2.0	27500m^2										55000
*a	2B	3.0	12	15	2	2							276
*	2C	2.0	14	17	5	5							263
*a	3A	7.0	38	54	23	42							10563
*a	4A	8.0	58	68	38	52							23680
*a	4B	12.0	36	38	5	5							8358
*	5B	3.0	12	17	3	6							333
*a	5C	6.0	20	38	7	15							1995
*	5D	4.0	16	25	6	15							980
*a	6A	8.0	55	64	33	43							19756
*a	6B	5.0	16	43	6	10							1870
a	7A	1.0	21	95	21	95							1995
*	7B	3.0	13	32	7	23							865.5
*	7C	3.0	18	25	8	13							831
	8A	1.0	50	100	50	100							5000
*a	8B	2.0	13	20	3	7							281
*	8C	2.0	11	32	5	11							407
*	8D	2.0	11	29	2	6							343

TABLE XI (Continued)

Structure		h	Bw	Bl	Tw	Tl	Dist.A	Dist.B	Dist.C	Dist.D	Area	Type	Volume
ac	9A	0.5	$26400m^2$										13200
ac	9B	3.5	24	70	12	48	180	308	80	82	1680	4	3948
a	10A	1.0	12	20									240
ac	10B	5.0	27	45	10	27	370	350	48	50	1215	2	3712.5
ac	10C	5.0	25	28	8	10	325	348	20	50	700	2	1950
c	10D	5.0	28	28	8	10	325	328	20	48	784	2	2160
a	11A	0.5	10	15									75
ac	11B	3.5	20	25	10	13	432	460	23	25	500	2	1102.5
ac	11C	1.5	22	25	12	16	440	480	23	28	550	2	556.5
ac	11D	1.5	15	20	10	14	460	478	25	28	300	2	330
c	12	0.5	4	4	4	4	270	246	20	27	16	6	8
ac	13	2.5	22	26	5	5	265	266	20	21	572	4	1746.3
ac	14	4.5	22	33	5	8	280	270	21	27	726	4	1723.5
ac	15	17	39	42	6	16	314	262	24	38	1638	4	1473.9
ac	16	1.0	11	23	6	8	340	278	24	28	253	5	150.5
c	17	0.5	10	12	4	4	400	300	45	54	120	6	34
ac	18	1.0	12	15	8	10	425	355	51	54	180	5	130
a	19A	0.5	20	20									200
ac	19B	3.5	34	45	32	40	505	430	48	50	1530	3	4917.5
cd	19C	3.5	17	40	8	30	540	478	48	65	580	3	1610

TABLE XI (Continued)

Structure		h	Bw	Bl	Tw	Tl	Dist.A	Dist.B	Dist.C	Dist.D	Area	Type	Volume
ac	21	5.0	25	32	7	10	540	572	97	109	800	4	2175
ac	22	0.5	9	12	3	3	330	398	40	70	108	6	31
*a	23	30	10	17	5	7							307.5
ac	24	0.5	10	11	4	4	355	306	19	22	110	6	31.5
	25A	0.2	4	4									3.2
c	25B	0.5	9	17	7	9	298	170	10	26	153	3	54
c	25C	0.6	10	11	9	9	300	160	10	16	110	3	57.3
acd	26	0.5	2	12	4	6	335	125	24	25	144	6	42
c	27	0.5	9	14	3	3	345	100	25	30	126	6	33.8
cd	28	0.5	9	10	5	10	315	132	19	24	90	6	35
ac	29A	1.5	80	100	80	100					8000		12000
ac	29B	11.0	38	44	6	8	430		68	71	1672	4	9460
c	30	0.8	19	24	12	12	360	128	39	67	456	5	240
c	32	1.2	29	32	9	10	300	317	24	45	928	4	610.8
ac	34	1.0	14	16	6	6	382	208	23	42	224	4	130
c	35	0.4	16	18	16	18	372	228	23	24	299	5	115.2
c	36	0.3	7	9	7	9	250	240	10	24	63	6	18.9
c	37	1.0	8	14	4	5	345	250	10	28	112	5	66
ac	38	1.3	24	28	10	10	320	254	28	37	672	4	501.8
c	39	0.3	10	11	10	11	460	100	15	19	110	6	42.9

TABLE XI (Continued)

Structure		h	Bw	Bl	Tw	Tl	Dist.A	Dist.B	Dist.C	Dist.D	Area	Type	Volume
c	40	0.3	7	9	7	9	475	110	12	15	63	6	18.9
c	41	0.2	9	10	9	10	470	118	12	19	90	6	18
c	42	0.3	12	15	12	15	510	95	12	38	180	5	54
c	43	0.3	9	11	9	11	505	85	12	41	99	6	29.7
c	44	1.5	22	25	5	6	545	124	38	41	550	4	435
c	45	0.2	8	11	8	11	530	139	52	62	88	6	17.6
a	46A	0.3	4	8									9.8
c	46B	1.5	17	25	7	8	630	230	17	72	425	3	360.8
ac	46C	1.1	16	25	8	10	630	235	17	78	400	3	264
	49	0.7	15	25	6	8	1500	1484	76	236	375	5	148.1
a	50A	0.5	10	60									300
ac	50B	3.0	27	44	10	26	486	150	44	47	1188	1	2172
ac	50C	2.2	22	24	8	12	530	174	18	38	528	1	686.4
ac	50D	2.2	27	43	10	26	565	208	33	38	1161	1	1563.1
ac	50E	2.5	20	23	8	12	535	188	18	33	460	1	695
c	52	0.3	2	2	2	2	392	90	18	30	4	6	1.2
ac	53	3.0	30	32	8	9	432	180	78	108	960	4	1548
ac	54	3.5	24	29	8	10	250	169	30	66	696	4	1358

TABLE XI (Continued)

Structure		h	Bw	Bl	Tw	Tl	Dist.A	Dist.B	Dist.C	Dist.D	Area	Type	Volume
ac	57	1.0	9	13	4	4	346	79	18	35	117	6	66.5
c	59	0.4	10	13	10	13	365	58	19	22	130	6	52
	60	0.5	16	20	10	10	1432	1412	76	160	320	5	105
a	61A	1.0	12	12									144
ac	61B	2.5	20	30	8	12	235	224	28	50	600	3	870
ac	61C	2.5	18	22	8	12	237	204	28	24	396	3	615
	62A	0.2	12	12									28.8
	62B	0.5	5	10	3	3	1274	1242	10	46	50	3	14.8
	62C	0.6	12	12	6	6	1286	1251	10	56	144	3	54
	63A	0.2	8	8									12.8
	63B	0.3	8	10	8	10	1220	1190	8	52	80	3	24
	63C	0.4	8	12	8	12	1228	1196	8	46	96	3	38.4
	64	0.2	7	7	7	7	1184	1176	54	58	49	6	9.8
ac	65	1.5	23	31	9	12	318	188	30	56	713	4	615.8
ac	66	1.5	17	24	8	10	266	155	50	70	408	4	366
c	67	0.1	8	11	8	11	255	180	24	49	88	6	17.6
c	68	0.4	3	4	3	4	376	45	12	22	12	6	4.8
c	69	0.4	3	4	3	4	376	56	12	22	12	6	4.8
	70	0.5	12	12	6	6	870	740	56	68	144	6	45

TABLE XI (Continued)

Structure	h	Bw	Bl	Tw	Tl	Dist.A	Dist.B	Dist.C	Dist.D	Area	Type	Volume
c 71	0.4	4	5	4	5	352	70	18	19	20	6	8
c 72	0.2	5	7	5	7	174	250	12	13	35	6	7
c 73	0.4	12	14	12	14	180	244	12	13	168	5	67.2
c 74	0.6	7	10	6	6	188	237	13	13	70	6	31.8
c 75	1.0	3	9	3	6	205	229	8	8	27	6	22.5
76A	2.5	14	26									910
ac 76B	4.0	33	34	16	20	950	546	24	25	1122	2	2884
c 76C	1.0	16	18	10	10	965	564	25	46	288	2	194
ac 76D	1.8	12	20	8	8	927	520	24	46	240	2	273.6
ac 77	1.0	7	8	3	3	218	228	20	23	56	6	32.5
c 78	0.8	14	20	7	7	942	545	25	26	280	5	131.6
c 80	1.3	19	20	7	7	965	570	20	25	380	4	278.9
c 81	1.0	5	11	3	5	200	232	7	8	55	6	35
c 82	0.4	13	27	13	27	1035	640	68	72	351	5	140.4
ac 84	0.5	12	15	3	6	885	481	29	38	180	5	49.5
c 85	0.5	13	16	4	4	860	464	38	51	208	5	56
c 86	0.3	12	14	12	14	910	509	25	29	168	5	50.4
c 87	0.4	11	13	11	13	905	320	44	49	143	6	57.2
c 88	0.4	10	23	10	23	935	322	29	38	230	5	92

TABLE XI (Continued)

Structure		h	Bw	Bl	Tw	Tl	Dist.A	Dist.B	Dist.C	Dist.D	Area	Type	Volume
c	90	2.0	11	20	6	8	322	142	30	36	220	4	268
c	93	0.9	26	27	17	18	700	296	69	64	702	5	453.6
ac	94	0.4	11	17	11	17	625	222	100	122	187	5	74.8
c	95	0.5	7	8	2	2	486	353	68	80	56	6	15
cd	96	0.5	9	13	3	4	542	422	22	56	117	6	32.3
cd	97	1.3	16	20	4	6	565	440	22	25	320	4	233.6
ac	98	1.5	19	24	10	16	584	464	25	46	456	4	462
c	99	1.0	14	16	8	10	758	668	20	131	224	5	152
c	100	1.0	15	20	10	10	665	658	32	94	300	5	200
c	101	0.5	16	19	5	6	680	682	32	90	304	5	83.5
ac	102	0.5	14	20	6	6	762	737	20	90	280	5	79
cd	103	0.5	11	16	7	7	780	757	20	103	176	5	56.3
c	105	0.8	14	24	4	12	210	278	17	21	336	5	153.6
cd	106	0.5	4	5	4	5	195	277	17	20	20	6	10
c	107	0.5	8	11	3	3	210	258	20	21	88	6	23.5
c	108	0.9	16	22	8	12	252	301	38	45	352	5	201.6
c	110	0.2	9	12	9	12	292	290	24	38	108	6	21.6
c	111	0.9	16	34	8	18	355	373	28	57	544	5	309.6

TABLE XI (Continued)

Structure	h	Bw	Bl	Tw	Tl	Dist.A	Dist.B	Dist.C	Dist.D	Area	Type	Volume
ac 112	1.6	18	32	7	14	370	403	28	67	576	4	539.2
c 113	0.7	15	17	6	12	410	371	38	57	255	5	114.5
c 114	0.5	16	18	8	8	410	337	38	80	288	5	88
115A	0.3	8	10									24
ac 115B	1.2	14	19	10	10	631	494	16	21	266	2	219.6
c 115C	0.9	13	16	5	5	615	469	14	21	208	2	104.9
c 115D	0.9	12	13	6	7	630	478	14	16	156	2	89.1
116A	0.4	18	20									144
ac 116B	2.2	22	23	10	12	576	562	25	27	506	1	688.6
c 116C	1.5	14	22	6	11	590	589	25	31	308	1	280.5
c 116D	1.0	13	15	10	10	698	584	22	31	195	1	147.5
c 116E	1.3	19	27	14	14	592	560	22	27	513	1	460.9
c 120	0.8	19	22	5	5	316	214	30	46	418	5	177.2
c 124	0.3	4	7	4	7	373	62	12	36	28	6	8.4
128A	0.2	5	5									5
128B	0.3	5	6	5	6	1160	1178	8	62	30	3	9
128C	0.4	7	12	7	12	1164	1176	8	54	84	3	33.6
129	0.2	8	14	8	14	1166	1140	58	58	112	6	22.4
130A	0.3	15	15									67.5

TABLE XI (Continued)

	Structure	h	Bw	Bl	Tw	Tl	Dist.A	Dist.B	Dist.C	Dist.D	Area	Type	Volume
	130B	1.0	15	16	13	13	1062	1046	20	52	240	3	204.5
	130C	0.4	4	12	4	12	1076	1062	20	38	48	3	19.2
	131	0.3	8	9	8	9	1072	1030	26	32	72	6	21.6
	132A	1.0	30	40									1200
	132B	1,2	18	20	8	10	1066	1036	26	32	360	3	264
	132C	1.2	12	16	6	8	1048	1014	26	26	192	3	144
d	133	0.4	12	16	12	16	1036	972	18	36	192	5	76.8
	134	0.2	4	5	4	5	1016	954	18	24	20	6	4
	135	0.5	12	18	6	6	1004	934	22	24	216	5	63
d	136	0.4	5	8	5	8	986	912	22	24	40	6	16
d	137	0.4	15	19	15	19	972	908	24	34	285	5	114
	138	0.3	6	9	6	9	912	868	28	28	54	6	162
	139A	0.2	2	4									1.6
	139B	0.5	4	4	2	2	908	878	6	26	16	3	5
	139C	0.5	4	4	2	2	916	884	6	28	16	3	5
	140A	0.3	4	4									4.8
	140B	0.5	9	12	4	4	896	898	12	60	108	3	31
	140C	0.6	10	10	4	4	906	902	12	52	100	3	34.8
	141	0.3	4	14	4	14	972	964	66	66	56	6	16.8

TABLE XI (Continued)

Structure	h	Bw	Bl	Tw	Tl	Dist.A	Dist.B	Dist.C	Dist.D	Area	Type	Volume
142	0.	12	12	12	12	902	982	46	66	144	6	28.8
143	0.3	16	16	16	16	914	940	46	66	156	5	76.8
144A	0.3	25	25									80
144B	2.0	18	25	10	10	1026	934	20	46	450	3	550
144C	0.4	4	6	4	6	1034	924	20	66	24	3	9.6
145	2.0	26	28	12	12	1132	1058	90	96	728	4	872
146A	0.2	20	20									30
146B	0.6	4	12	4	6	840	680	16	16	48	1	21.6
146C	2.0	10	10	8	8	866	694	14	16	100	1	164
146D	0.3	6	6	6	6	888	718	12	24	36	1	10.8
146E	2.0	20	20	10	10	894	736	24	26	400	1	500
146F	0.3	4	12	4	12	876	710	12	16	48	1	14.4
146G	1.0	10	13	5	7	858	694	14	16	130	1	82.5
147	0.6	14	18	7	9	914	610	160	230	252	5	94.5
148	0.6	18	20	8	10	1128	752	70	86	360	4	132
149A	0.2	15	10									
149B	0.9	12	20	6	10	1196	824	16	70	240	3	135
149C	1.1	12	12	6	6	1214	842	16	86	144	3	99
150	1.1	19	24	8	12	1272	912	86	100	456	4	303.6

TABLE XI (Continued)

Structure		h	Bw	Bl	Tw	Tl	Dist.A	Dist.B	Dist.C	Dist.D	Area	Type	Volume
	151	0.5	17	17	8	8	1210	776	68	94	289	5	88.3
	152	0.3	13	13	13	13	1274	844	60	68	169	5	50.7
	153	0.2	6	6	6	6	1294	862	60	94	36	6	7.2
e	201						732	300	66	80			
e	202						776	346	14	20			
e	203						790	362	12	14			
e	204						790	362	12	20			
e	205						832	422	102	144			
e	206						676	300	80	100			
e	207						770	402	88	96			
e	208						700	370	82	96			
e	209						782	450	82	88			

TABLE XI (Continued)

VOLUME OF WELLS AND DEPRESSIONS

Structure	Depth	Length	Width	Dist.A	Dist.B	Dist.C	Dist.D
20				384	392	20	46
48				1588	1574	90	166
79	1.0	100	100	984	578	56	84
83				1236	812	108	120
89				844	446	32	126
91				830	870	70	70
92				1300	1270	40	80
104				164	346	36	64
117				430	344	20	26
118				330	226	12	16
119				1034	1010	12	26
123				208	254	6	28
125				796	830	74	86
154	4.0	140	220	1560	1120	260	284
155				480	100	4	14
156				1146	1078	20	104
162				1236	906	90	150
163	1.0	80	80	910	808	82	110

APPENDIX B

SOIL

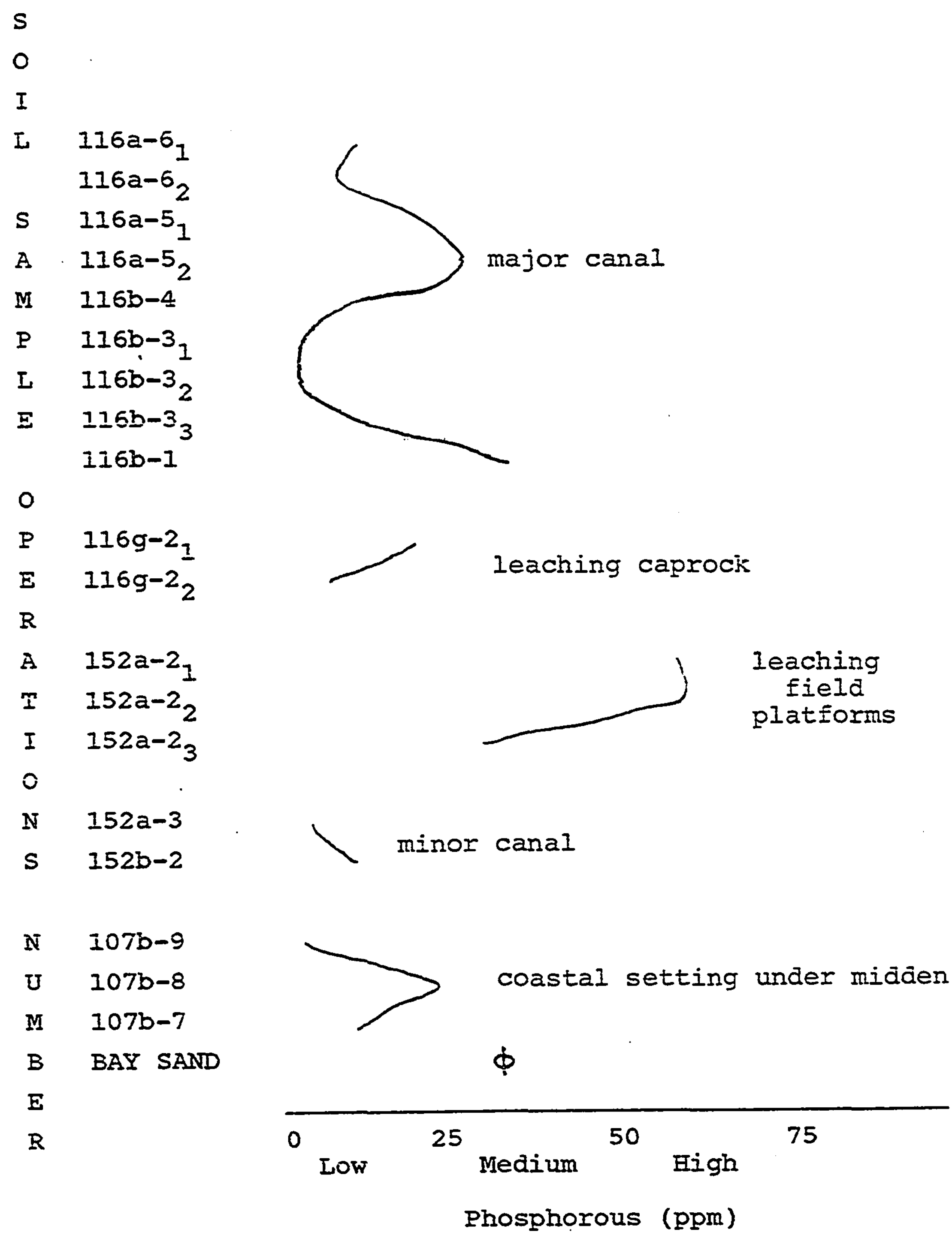
Sixteen of the twenty soil samples taken for analysis were collected from our canal operations. The remaining four samples were collected from Feature 33A (Operation 107). One control sample of sterile surface beach sand was collected for analysis from an area immediately north of Operation 107 and on the present shoreline.

Obtaining control soil samples unaffected by later cultural disturbance was not an easy task considering the size and duration of occupation at Cerros. The only soils that qualify are the beach sand sample and the three samples taken from under Structure 9A and the Co'h phase occupation at Feature 33. The caprock samples have also been minimally affected.

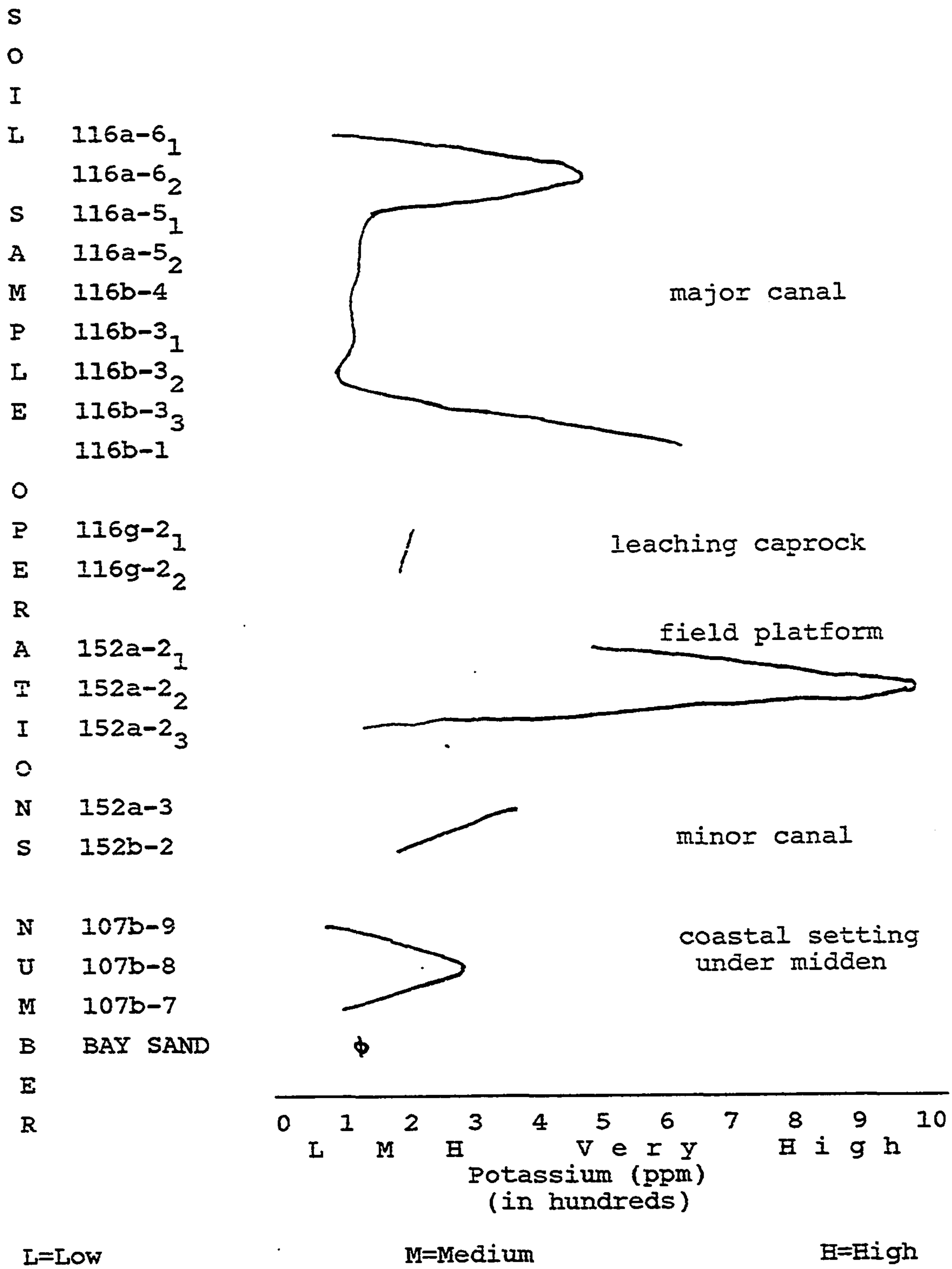
The locations of the various samples are provided within the appropriate profile sections. A physical description of the matrices is included in the data chapters. All samples were run at the same time and at the same laboratory for comparability.

The five areas in the settlement chosen for analysis each provided two or more stratigraphically meaningful samples. The following graphs give the

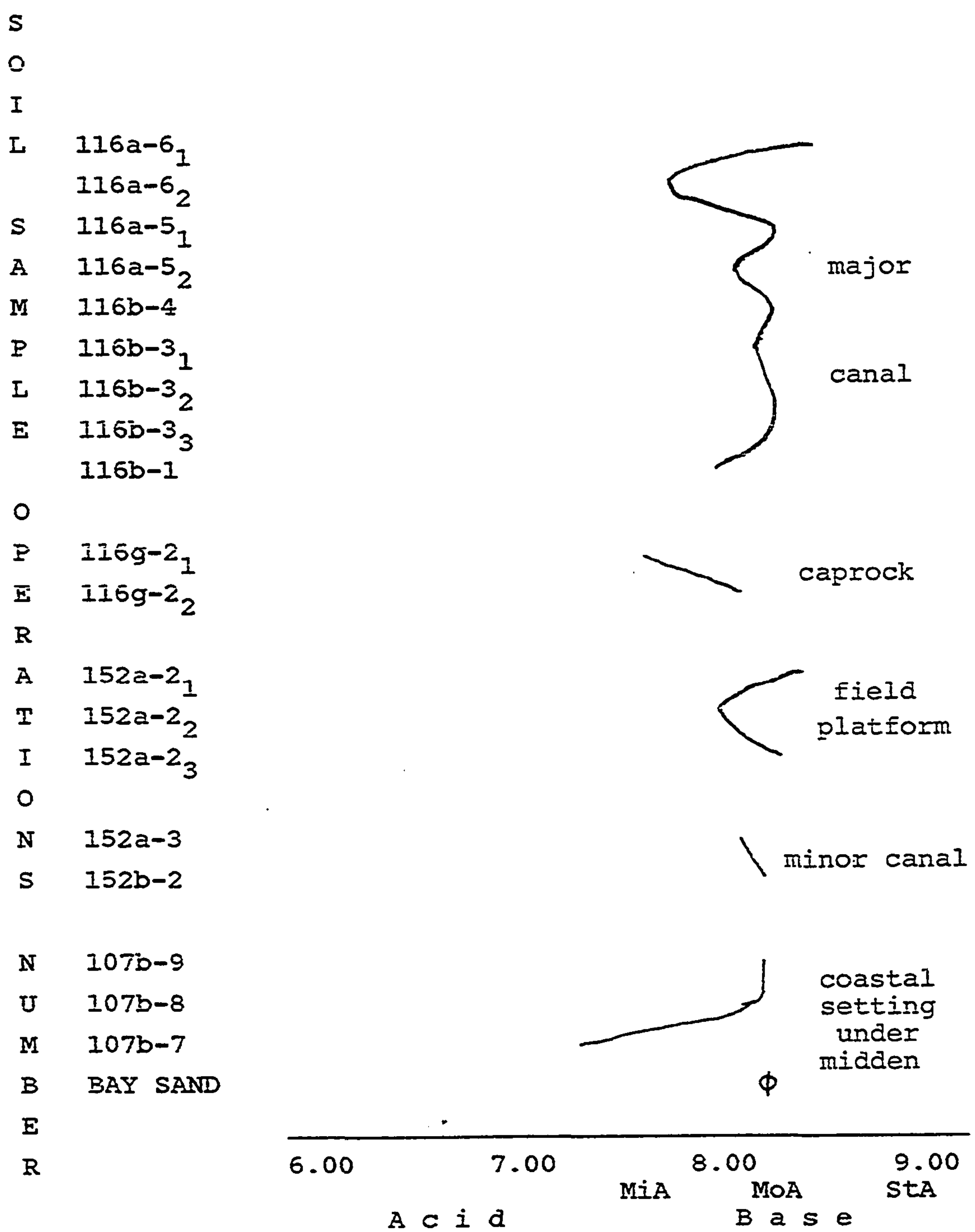
PHOSPHOROUS READING
(Unfixed)



POTASSIUM READINGS
(Unfixed)

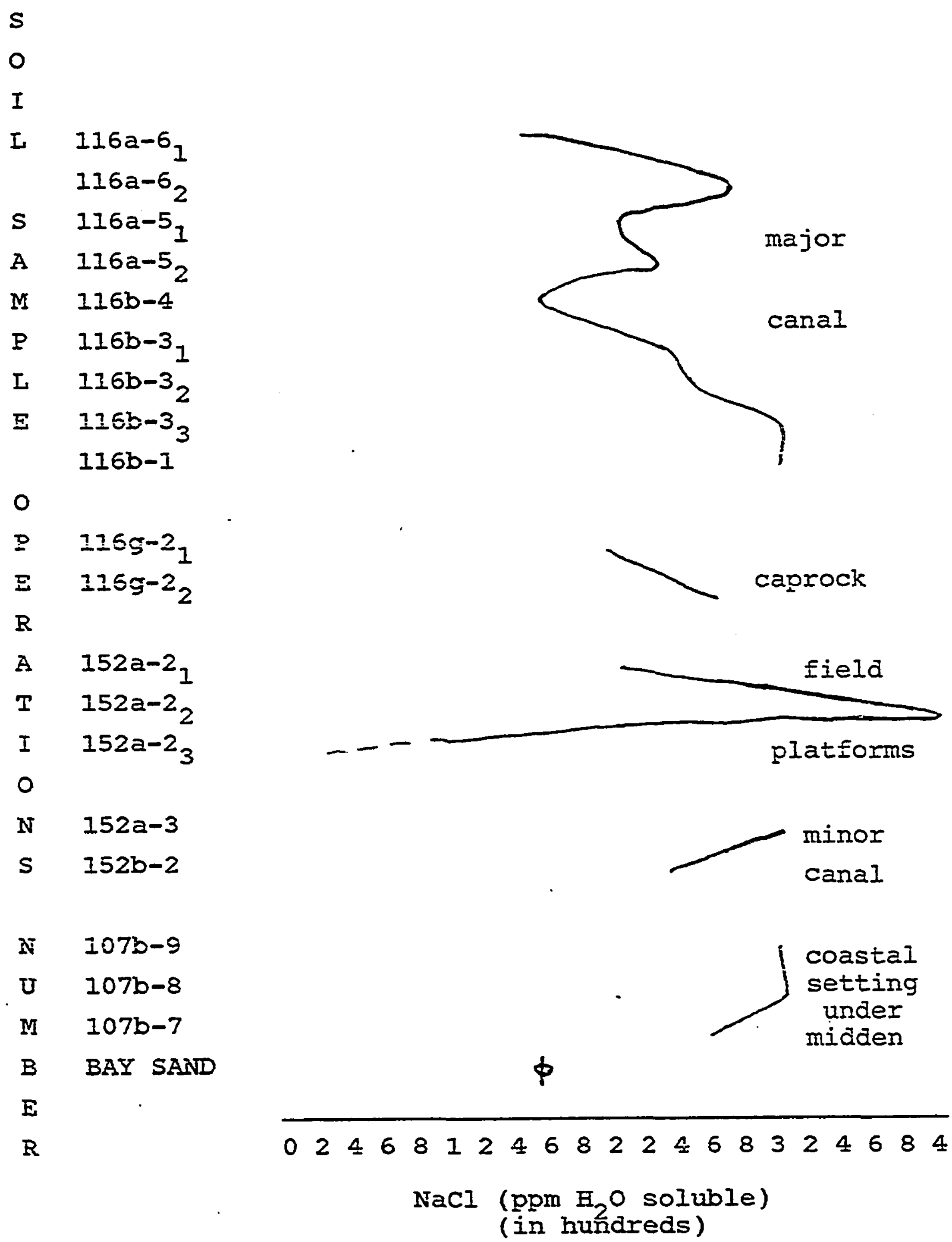


pH READING



MiA=Mildly Alkaline MoA=Moderately Alkaline
StA=Strongly Alkaline

SALT CONCENTRATIONS



stratigraphic position of the various samples one above another.

Interpretation

Soil analysis requires a series of tests to reveal trends and relationships. Our chemical data have produced some suggestive relationships. In regard to our nine soil samples taken from the main canal all four graphs indicate a similar distribution of points. This suggests that the sediments within each level of the main canal have undergone a similar set of chemical disturbances. Additional soil tests were run for nitrogen, calcium and magnesium, but the results were the same throughout all samples across the site. Nitrogen was low and calcium was greater than 4000 ppm, or very high. Some slight variability was detectable in the magnesium ppm, but all were considered high. The sodium chloride in our samples is considered a moderate hazard to plants, especially during seed germination, but significant variability was noted in the samples. The high salt content is considered a consequence of recent brackish water invading the site setting (see Physical Environment). All chemical analysis was carried out at the Soil Testing Laboratory, College Station, Texas (the Texas agricultural extension service which provides data on elements which are in a form available to plants).

Consultation with David Shannelbrook, a geologist with Hunt Energy in Dallas, has provided a cursory physical examination of the soils. Grain size tests were not possible given the recrystalized nature of the sediments and the high calcium carbonate fraction. All samples reacted strongly to hydrochloric acid treatment.

Major Canal

The basal sterile <u>sascab</u> marl matrix (Op 116a-6_1) indicates a strongly alkaline condition apparently underlying the caprock, although leaching of sediments through the canal cut may have affected this reading. The low salt content may be indicative of the freshwater content of the original canal. It is slightly lower than the present beach sand, which is thought to be very well drained.

This sample consisted of extremely fine clay particles. A few root intrusions were apparent, perhaps remnants of riverine grasses and weeds associated with the original canal bottom. A bit of limonite in the sample, indicative of FeS_2 (pyrite) formation, suggests its oxidation in water before the more reduced conditions associated with its present location.

The thin, dark, blocky, loamy clay paleosol (Op 116a-6_2) overlying the <u>sascab</u> marl matrix indicates a mildly alkaline condition approaching that of freshwater. The high salt content may be a consequence of the

underlying impermeable <u>sascab</u> preventing the leaching through of particles. Although the phosphorous readings are not high, the potassium readings may further indicate the trapped nature of these elements. It should be noted that the readings for this paleosol are more similar to the surface humate horizon (Op 116b-1) than to other samples taken elsewhere in the settlement. This suggests the organic nature of this dark lens.

This sample consisted of loamy clays having undergone recrystalization or recementing through the effects of percolating ground water charged with calcite and dolomite. Sulfates (calcium sulfate or gypsum) are present suggesting the organic constituents in a paleosol. The dark brown color of the lens further suggests an organic component, however, quantifiable tests for organic carbon or organic matter have not been conducted. Even so, the poorly sorted nature of the sediments coupled with the above examination indicate this lens to have been an organic paleosol. It is analogous to other paleosols revealed elsewhere in the settlement.

The thin deposit of granular, yellow clay associated with decomposing angular limestone gravel (Op 116a-5_1) overlying the paleosol has provided readings not unlike those recorded for the caprock samples (Op 116g-2). This is in keeping with the argument that these gravels

represent eroded or quarried caprock associated with the initial infilling and abandonment of the main canal.

This sample consisted of a yellowish clay sand cemented by fine grain particles (recrystalization). The high water table is in part responsible for this condition. A low percentage of organic constituents are present; an expected result given the position of the lens relative to the paleosol. The lens is particularly abundant in limonite (producing the yellowish tint) indicative of FeS_2 forming as a consequence of fossil bryozoan or coral breakdown. Although these fossils may occur in the caprock formation, there is some suggestion that some of the bryozoans do not appear in it locally. In this vein, an intrusive bryozoan would suggest that some other agent carried these fossilized remnants into the canal from another marine limestone source. If the two siliceous limestone shoals mentioned earlier (p. 32) laying on the New River and south of the site could be traced as the source, then a tidy argument could be advanced in regard to the connection between the canal and the New River.

A sample was taken from immediately above the gravel deposit and consisted of poorly sorted clay silt (Op 116a-5_2). The chemical readings are in line with the adjacent soils underlying and overlying this sample. They may reflect a leached condition. However, the unusually high phosphorous reading (relative to other

samples in the main canal) may be attributable to the high phosphorous frequencies recorded on the field platforms (Op 152-2). Given that the canal sediments have been argued to represent an inverted raised field profile, the stratigraphic position of this high phosphorous reading corresponds well with those located in the present raised field zones. The redepositional history of the canal sediments may account for the lower actual readings.

This sample is defined by a light grey clay silt apparently lighter in hue as a consequence of the underlying yellow limonite. The grains are poorly sorted and cemented together. A high frequency of worm casts and gastropods are reported. They are post-depositional in origin.

A sample was taken from a grey clay silt above the previous sample (Op 116b-4). The chemical readings are in line with the adjacent samples. They may reflect a leached condition. The sample is not well sorted, being cemented together. It contains post-depositional worm casts and gastropods. A sample of the blocky, dark grey clays overlying the above sediments was taken for analysis (Op 116b-3_1). These chemical readings are similar to the two previous samples. They reflect a leached condition. The sample is better sorted than the underlying matrix. Little secondary cementing has affected this sample, probably due to its elevated

location relative to the dry season water table. The matrix is intruded by recent Pomacea shells, but few worm casts are apparent.

The yellow grey clay deposit is defined near the surface of the caprock edge (Op 116b-3_2). The chemical examination of this sample reveals a similar data set to the samples below it. The sediments appear to be well leached with no recyrstalization of the matrix. The matrix is intruded by Pomacea shells, but few worm casts are reported. This soil is associated with the most recent lateral erosion of the caprock. Many of the chemical readings fall within the variability of the caprock (Op 116g-2).

A sample was taken from the light grey clay intruded by pebbles to large cobbles (Op 116b-3_3). This matrix was found to overlie the bulk of the blocky grey clay silt within the canal. This sample is associated with the deliberate and final infilling operation of this section of the main canal. The chemical data suggest there is an increase in the amount of minerals in the soil over the underlying sediments. This may be attributable to the presence of the decomposing limestone gravels throughout the deposit as well as the more severe erosional agents apparent near the surface of the exposure. The matrix is friable, showing no evidence for recementing. Organic debris and root cast are present as are low

frequencies of gastropods. The samples appear severely leached.

A surface sample was taken from near the surface of the black gumbo humus horizon (Op 116b-1). This loamy clay was intruded by pebble size limestone gravels associated with the final infilling operation. The chemical analysis indicates relatively high values for the various elements. The combination of decaying organic debris and severe erosional attack upon the parent limestone gravel material has released these elements to the soil. The matrix appears to be better drained judging from the lower pH values and a marked absence of recemented particles. The higher phosphorous readings may be a consequence of the redeposited trash or midden fill associated with this Early Classic episode. The high organic content is attested to by the numerous rootlets. The chemical affinity this sample has to the paleosol should be further noted.

Caprock

The caprock soil samples were both taken from the northern bank of the canal exposure (Op 116g-2). The chemical analysis provide a somewhat controlled sample in assessing the natural composition of the caprock parent material. The effects of leaching appear to account for the higher potassium and phosphorous readings in the solid caprock as opposed to the overlying decomposing

matrix. The more basic and salt-laden weathering caprock suggests the percolation and redeposition of some minerals at this juncture between the B-horizon and the C-horizon.

The solid unweathered caprock is an off-white massive formation. The overlying weatherd caprock is a yellowish iron rich (limonite) formation. The oxidized state of the weathered caprock is caused by the high water table and capillary action. The leached nature of the formation is suggested by the absence of recemented particles. No worm casts or bryozoans are present and few rootlets have penetrated to this depth. This description is in keeping with caprock or caliche formation elsewhere in the world (Reeves 1970).

Field Platforms

The earthern platforms were sampled three times from the south end of our trenching operation (Op 152a-2). A sample was taken from the off-white granular friable matrix immediately overlying the decomposed yellow limestone caprock (op 152a-2_1). Bits of limonite were recorded. The chemical readings are high for all the elements analysed suggesting some cultural alteration of the field chemistry. The potassium reading coupled with the very high phosphorous percentage indicated that the field platforms were fertilized. The phosphorous readings from this sample and the one stratigraphically above it are especially significant given the generally low

phosphorous readings elsewhere in the settlement and the deficient readings recorded by Wright et al. (1959) for Lowry's Bight. The moderately high alkalinity of the soil may be attributable to the decomposing limestone caprock in the vicinity.

Another sample was taken from a dark grey sandy clay overlying the previous sample (Op 152a-2_2). This sample recorded the highest chemical readings of all samples run. The extremely high potassium percentages coupled with the highest phosphorous readings in the settlement further suggest fertilization. The high salt content might indicate the development of a k-horizon, but no pisolite concretions are apparent. The textural studies were inconclusive, though Pomacea disturbance was pronounced.

A surface sample was taken from near the surface of the platform within a light grey clay loam (Op 152a-2_3). The chemical readings are substantially lower than the two previous samples. This appears to be a consequence of the deflated nature of the platforms which have been severely leached, especially near the surface. The amount of rootlets and related organic debris was high. Pomacea disturbance was apparent.

Minor Canal

Two samples were analysed from the minor feeder canal circumscribing the field plot. One sample was

taken from within the presumably reworked off-white parent material (Op 152a-3). Another sample was taken from within the minor feeder canal sediments (Op 152b-2). Except for a minor difference between the two phosphorous readings, the chemical data illustrate a leaching profile. No quantifiable textural information was retrievable.

Coastal Setting

Three soil samples were examined from under the sub-plaza Structure 9A at Feature 33A. They may best reflect the character of the culturally undisturbed soils at Cerros. The basal yellow granular matrix appears to be the decomposing caprock (Op 107b-9). It also defines the dry season water table. The chemical readings are generally quite low but in the range of other decomposed caprock readings.

The next sample was taken from a blue grey clay overlying the caprock (Op 107b-8). The chemical readings are markedly higher for this sample than those above and below it and may be symptomatic of a leached condition. However, these clays have been argued elsewhere to be riverine in origin and may have higher element concentrations as a consequence of the rich sediment load carried by the ancient course of the New River. No grain size analysis was conducted.

A third sample was taken from the beige clay overlying the alluvial clays and underlying a house floor

(Op 107b-7). These sediments appear to be associated with the house floor preparation and may be quite disturbed. The low chemical readings suggest comparability to the decomposed caprock elsewhere. No textural analysis was carried out.

Bay Sands

The last sample from the site was taken from the present shoreline of Corozal Bay. It was anticipated to provide a sound control for our experimental soil samples. Although constituents of this beach sand suggest a local origin, many of the shell particles are from outside the site area. It should be noted that the phosphorous content is not high enough to account for the very high phosphorous reading on the fields. I have speculated elsewhere that this may have been the case.

APPENDIX C

MOLLUSCAN FAUNA

Molluscan fauna was collected from each stratigraphic lot and level defined in the main canal and raised field complex operations. Flotation samples were taken from each of these matrices. The sample sizes were generally small, even though two pound bags of earth were floated. Mr. Norm MacLeod, an advanced graduate student studying invertebrate paleontology at Southern Methodist University, analysed the samples and has provided the following interpretiva data. These data are of a preliminary nature.

1. The relative abbundance of species, which Dr. Feldman, the Director of the Museum of Anthropology at the University of Missouri, interpreted as possibly being indicative of fresh, moving water, increased from Operation 152 to Operation 116 (toward the main canal).
2. The relative abundance of <u>Pomacea flagellata</u> increased toward the top of the raised field platform deposits adjacent to the canal.

3. The relative abundance of P. flagellata showed a weakly defined decrease toward the top of the matrix which now fills the canal.
4. P. flagellata from the site show a strong bimodality with respect to size, with all specimens falling into two well-defined size groups: 35-50 mm. (adult shells) or 2-8 mm. (juvenile shells), the diameter measured through the widest part of the shell. No whole shells were found to fall into the intermediate size range (9-34 mm.). All other faunal components show an unimodal size distribution centered slightly to the left of the median for their size ranges.
5. Juvenile P. flagellata (2-8 mm.) are thought to be *in situ* owing to their relative abundance at greater depth, their complete lack of a periostracum, and their "old-looking" appearance.
6. The adult P. flagellata are understood to be intrusive because of their well preserved periostracum and their clear association with distinct burrows (the latter observation was made in the field).

P. flagellata occupy stagnant water and depressed swampy settings, being very common at the site today.

> . . . barring major climatic or other environmental variations attributable to nature, they (P. flagellata) were also common in the general area of Cerros during Mayan times. Although they were undoubtably

> common in the surrounding area, I do not think that P. flagellata was a common component of the fauna at Cerros itself during the time of its habitation. This is suggested by the absence of P. flagellata from the cultural deposits, given the fact that P. flagellata was used as a food source by the Mayan inhabitants of nearby settlements.
>
> The smaller P. flagellata group (2-8 mm.) . . . presence can be accounted for by regarding them as immigrants from surrounding populations (perhaps during the rainy season) that survived in the area for a time by occupying microhabitats of brackish water (perhaps on the raised fields themselves). These immigrants could not attain full size, however, due to drying up of the microhabitats, or by simply outgrowing the microhabitats. The area in general was not capable of supporting a population of P. flagellata. Of course, normal freshwater forms abounded in the canal itself.
>
> After abandonment of the site, drainage modification ceased and natural conditions returned, allowing the local population of P. flagellata which had been excluded during habitation to repopulate the area. Adult P. flagellata (35-50 mm.) are capable of burrowing to horizons which include cultural material and horizons formerly occupied by the canal. This is not only supported by the bimodality of the P. flagellata sample and the increase in relative abundance of P. flagellata toward the top of the section (generally), but also by direct observation of large P. flagellata at the ends of burrows.

(From letter to Dr. Lawrence H. Feldman from Norm MacLeod, April 7, 1980).

These preliminary data suggest that during the major construction and maintenance of the canal system, P. flagellata were not well adapted to the drained environs at Cerros.

APPENDIX D

VEGETATION TYPES

Monte Alto/Huamil (Acahuales) Strong Monte Alto Location		
Maya/Spanish Name	Latin Name	Comment
zapote, sapodilla	*Achras sapote*	dominant;*
chacah	*Bursera* simaruba	*
chicoloro	*Strychros panamensis*	
granadillo (rosewood)	*Dalbergia cubilquitzensis*	*
habin	*Piscidia piscipula*	
jobo	*Spondias mombin*	*
jobo	*Spondias purpurea*	
kenep	*Talisia ulivaeformis*	*
mahogeny (caoba)	*Swietenia macrophylla* king	*
ramon blanco	*Trophis racemosa*	
ramon rosa	*Brosimum alicastrum*	*
yaxnik	*Vitex gaumeri*	

*Strong ruin association.

Monte Alto/Huami (Acahuales) Strong Huamil Location		
Maya/Spanish Name	Latin Name	Comment
cylil	*Diospyros verae*	
feral calabash	*Crescentia cujete*	
guarumo	*Cecropia peltata*	*
katsim	*Acacia guameri*	
papayo, patas	*Carica papaya*	*
pata de vaca	*Bauhinia divaricata*	
pixoy	*Guazuma ulmifolia*	
subin (bull horn acacia)	*Acacia cookii*	*
xburut'	*Cucurbita radicans*	

Shoreline Location		
coco	*Cocos nucifera*	

*Strong ruin association.

Thorn-Scrub Savanna
Depressed Location

Maya/Spanish Name	Latin Name	Comment
muk	*Dalbergia glabra*	dominant
carrizo	*Arthrostylidium pittieri*	
chechem negra	*Metopium brownei*	
katsim	*Acacia gaumeri*	
sac pom ?	*Cupania triguetia*	
subin (bullhorn acacia)	*Acacia cookii*	

Elevated Location

katsim	*Acacia gaumeri*	dominant
pixoy	*Guazuma ulmifolia*	
subin	*Acacia cookii*	

<u>Yax'om Soil</u> or <u>Hulub Bajo</u>
(Akalche)

Maya/Spanish Name	Latin Name	Comment
hulub	*Bravaisia tubiflora*	dominant
chechem de caballo	*Cameraria belizensis*	
ciricote	*Cordia dodecandra*	
dama de noche	*Cestrum panamense*	
manteca ?	*Ampelocera hottlei*	
palo de sangre ?	*Virola koschuyi*	
tinta (logwood)	*Haematoxylon campechianum*	
zapotebobo (provision tree)	*Pachira aquadia*	

Zacatal

Maya/Spanish Name	Latin Name	Comment
unidentified grasses		dominant
camofillo	*Zamia furfuracea*	
carrizo	*Arthrostylidium pittieri*	
chechem negra	*Metopium brownei*	
duck flower	*Aristolochia sp*	
pixoy	*Guazuma ulmifolia*	
Santa Maria	*Calophyllum brasiliense*	
sawgrass	*Scleria bracteata*	
tulipan	*Malvaviscus grandiflorus*	
xcanan	*Hamelia patens*	

Bajo Fringe or Huanal		
Maya/Spanish Name	Latin Name	Comment
huano	Sabal mauritii-formis	dominant
bobwood, huano	Anona glabra	
camotillo	Zamia furfuracra	
chit ?	Thrinax wendlandia	
escoba palm (give and take palm)	Cryosophila argentea	
granadillo (rosewood)	Dalbergia cubilquit-zensis	
habin	Piscidia piscipula	
palmetto	Acuelorraphe wrightii	
pucte	Bucida buceras	
Santa Maria	Calophyllum brasiliense	
xchai	Jatropha tubulosa	

Mangrove Shoreline		
Maya/Spanish Name	Latin Name	Comment
mangle colorado	Rhizophora mangle	dominant

Sources:

Barrera, et al. (1976)
Bartlett (1936)
Lundell (1934, 1937, 1938)
Standley and Record (1936)
Wright et al. (1959)

APPENDIX E

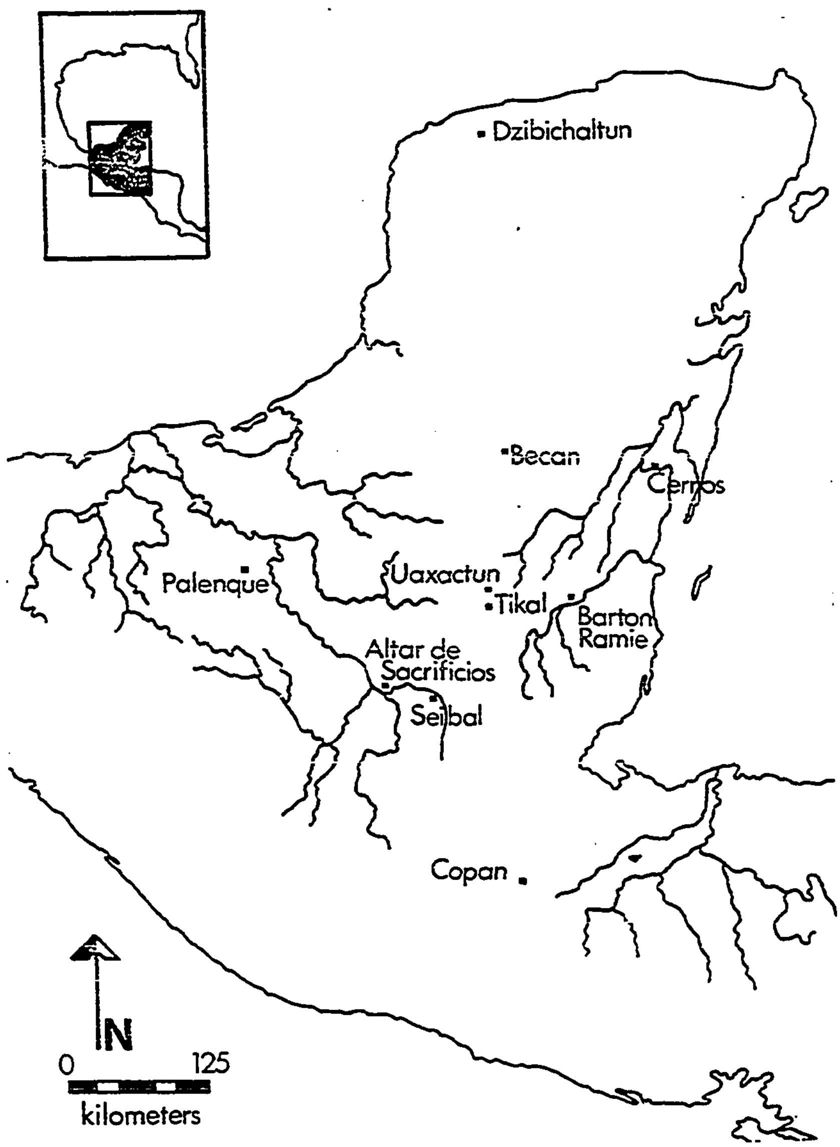


Fig. 1. Map of the Maya Lowlands

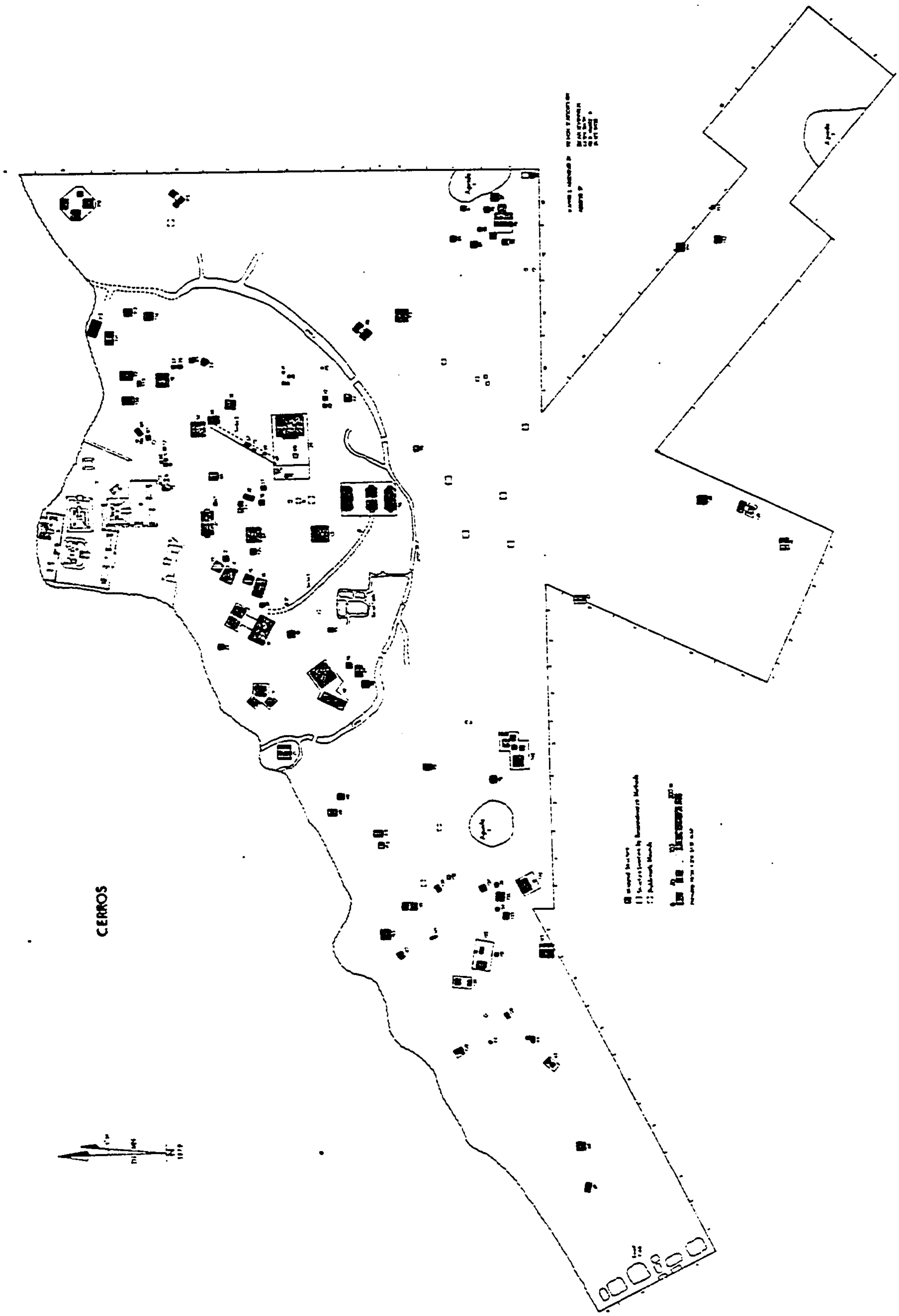


Fig. 2. Map of Cerros

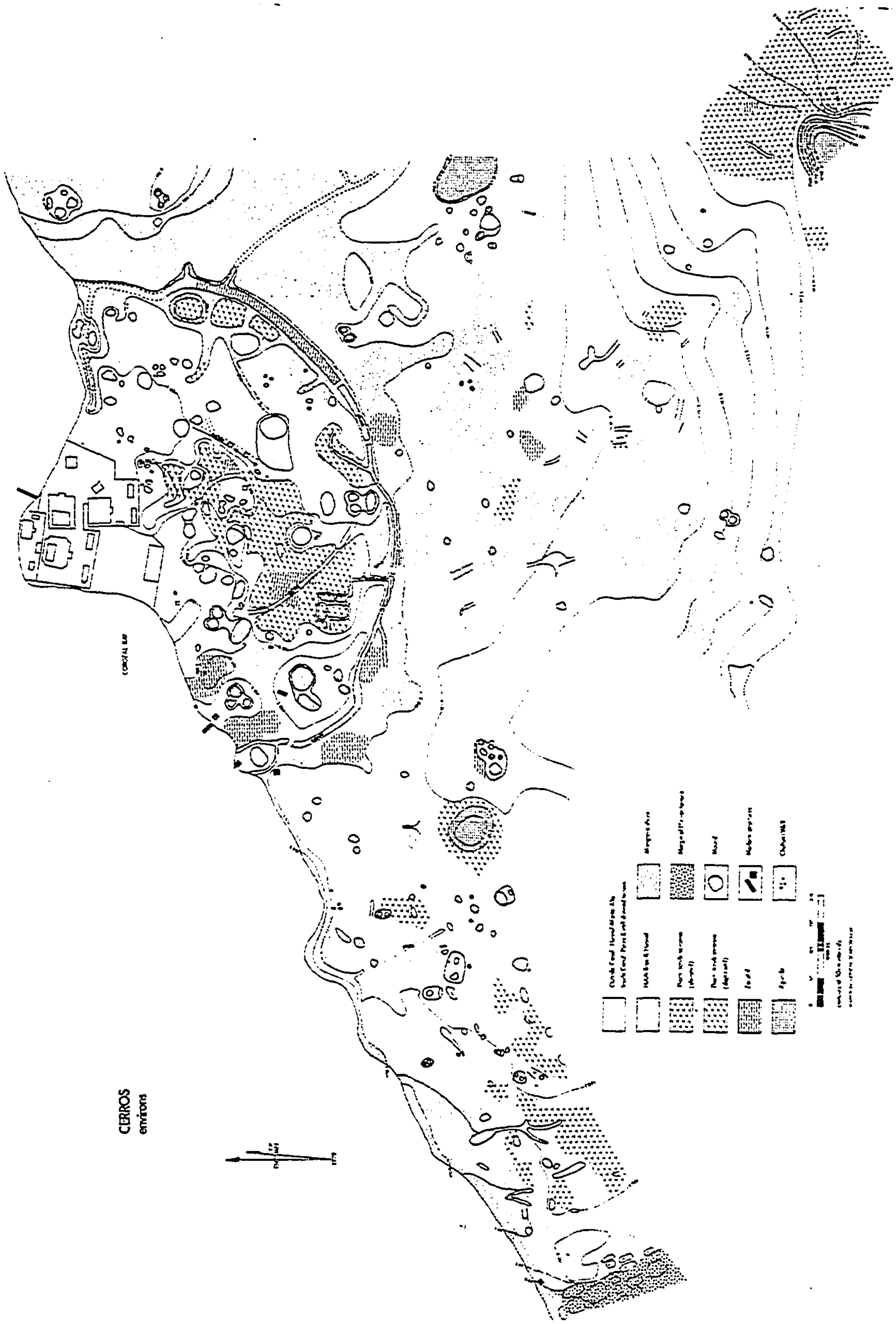


Fig. 3. Map of Cerros Environs

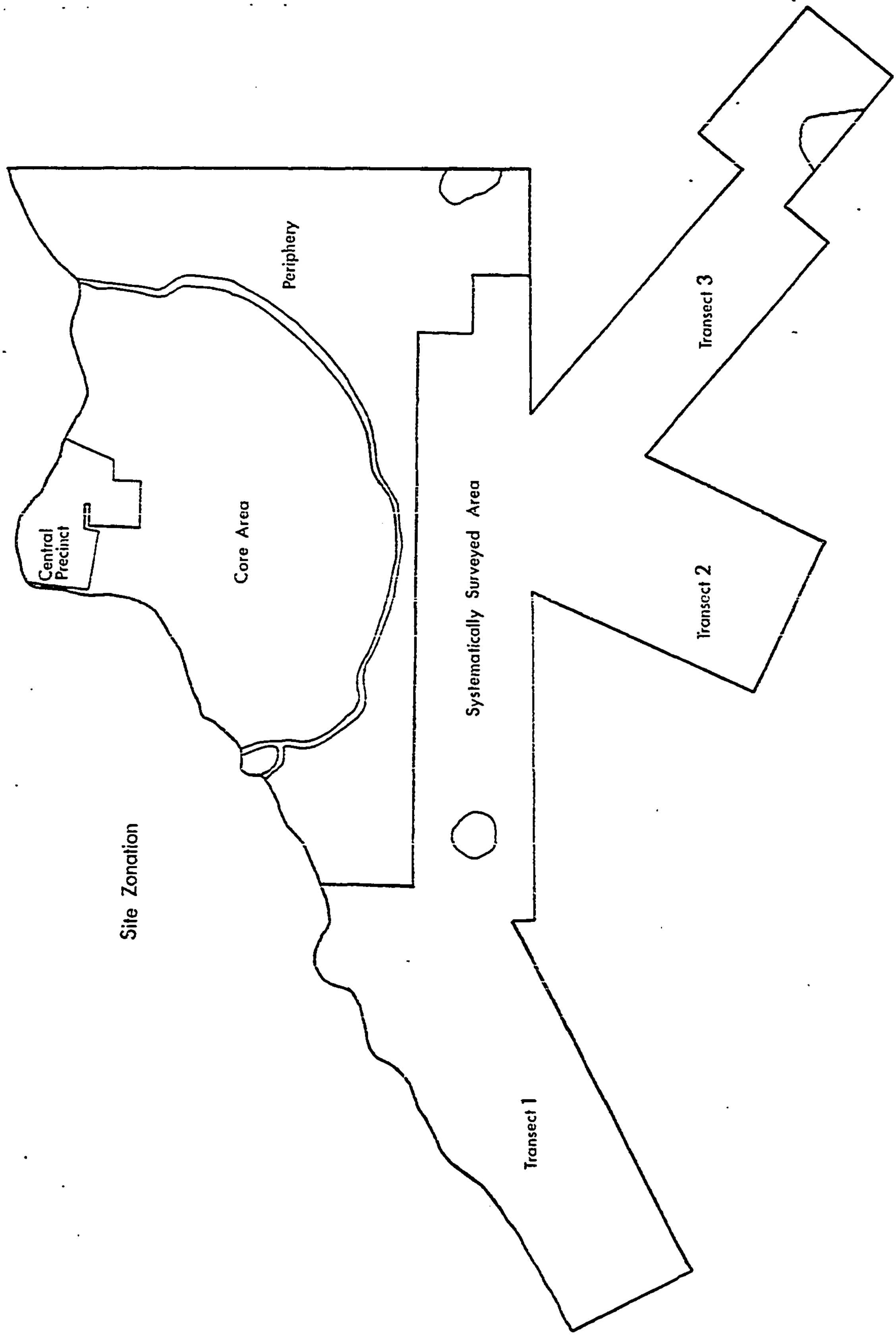


Fig. 4. Map of Site Zonation

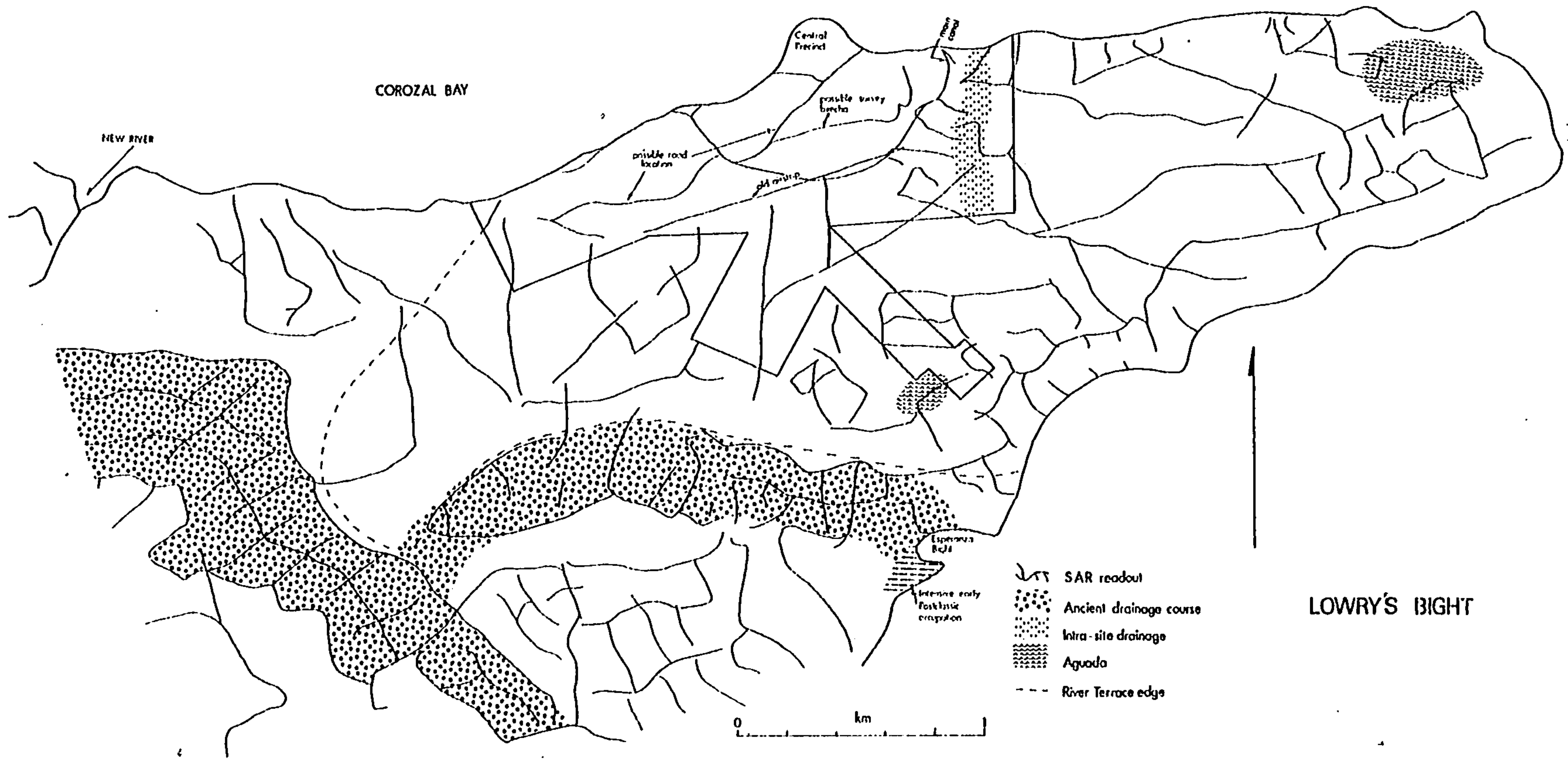


Fig. 5. Map of Lowry's Bight

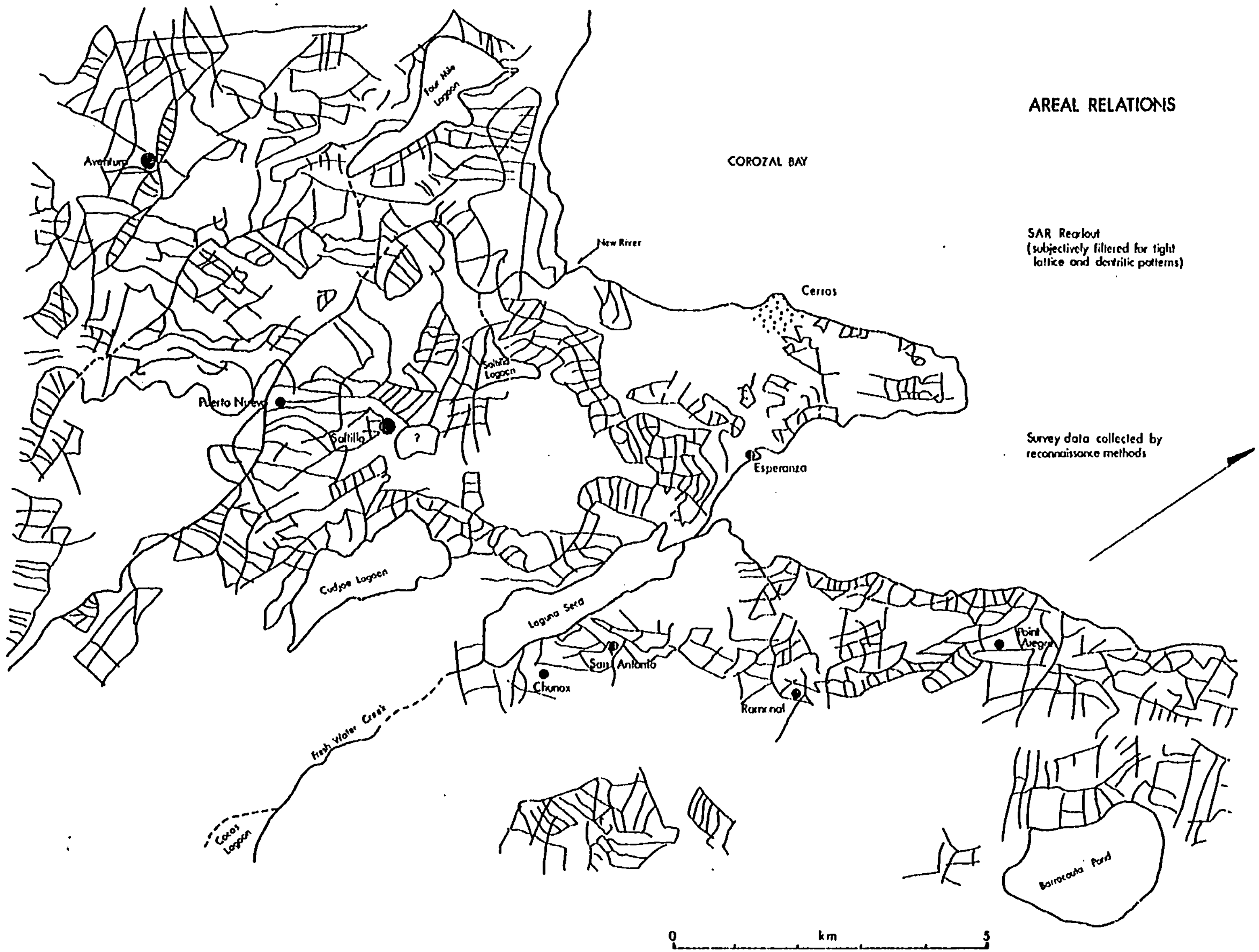


Fig. 6. Map of Areal Relations

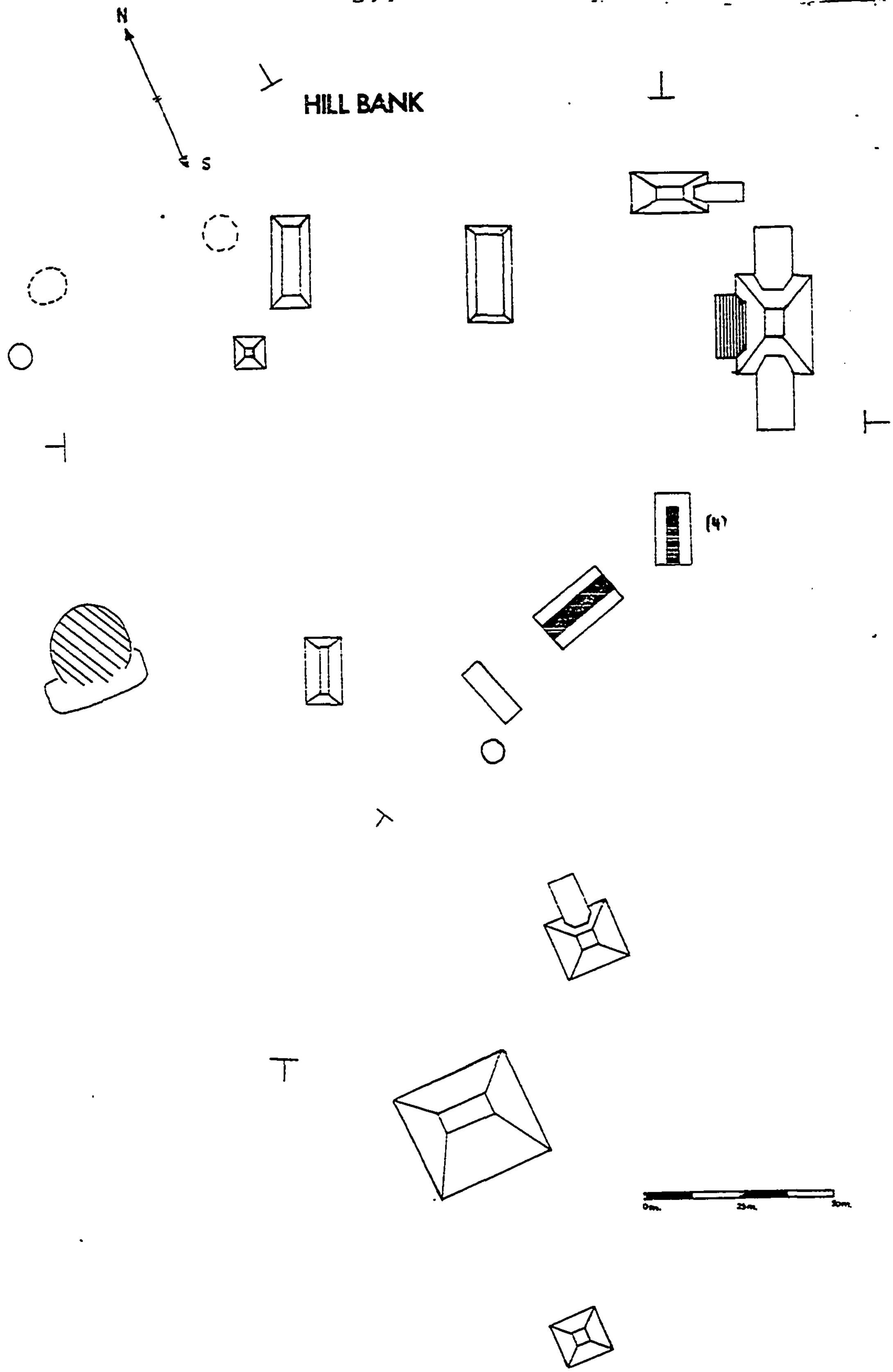


Fig. 7. Map of Hillbank

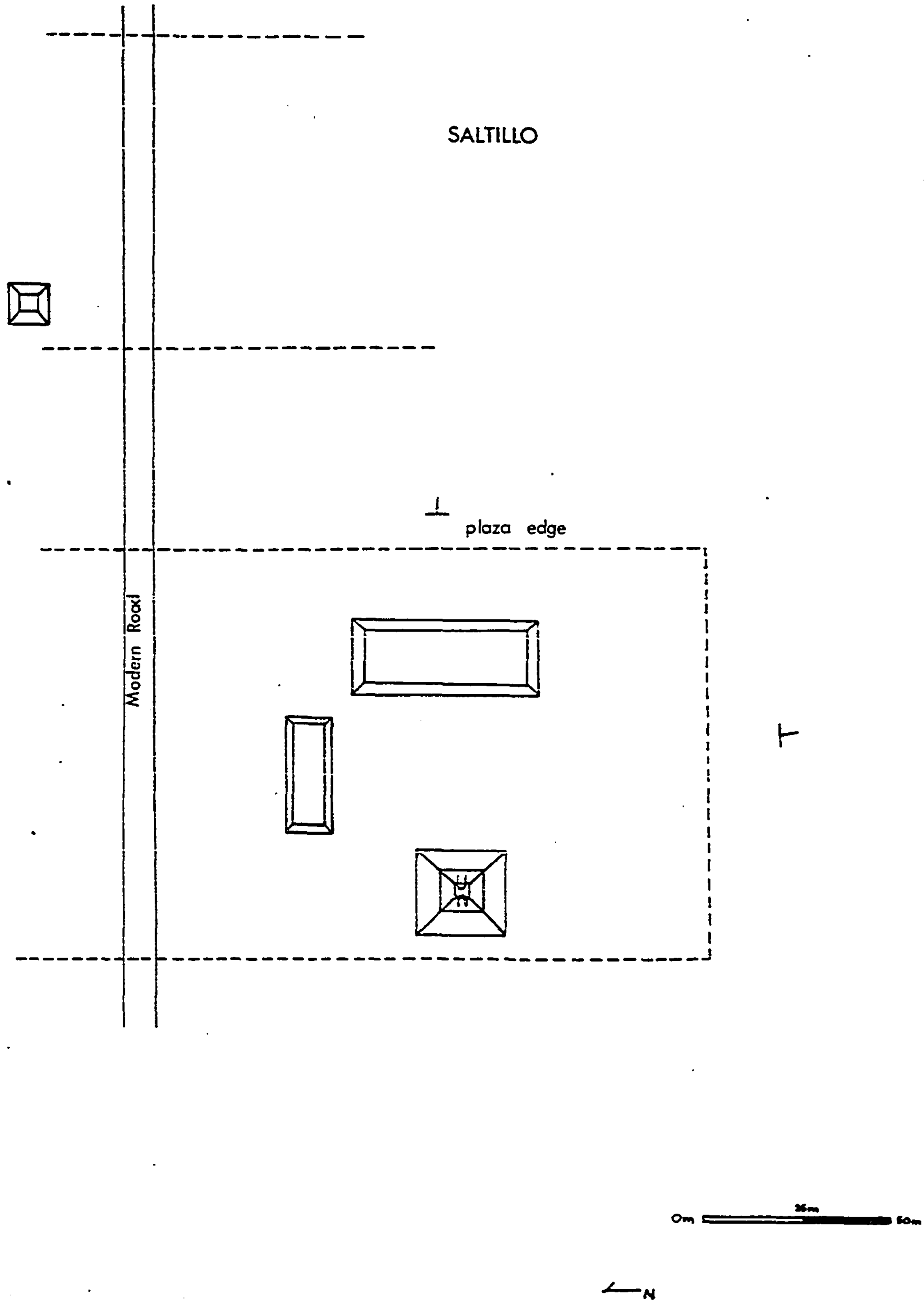


Fig. 8. Map of Saltillo

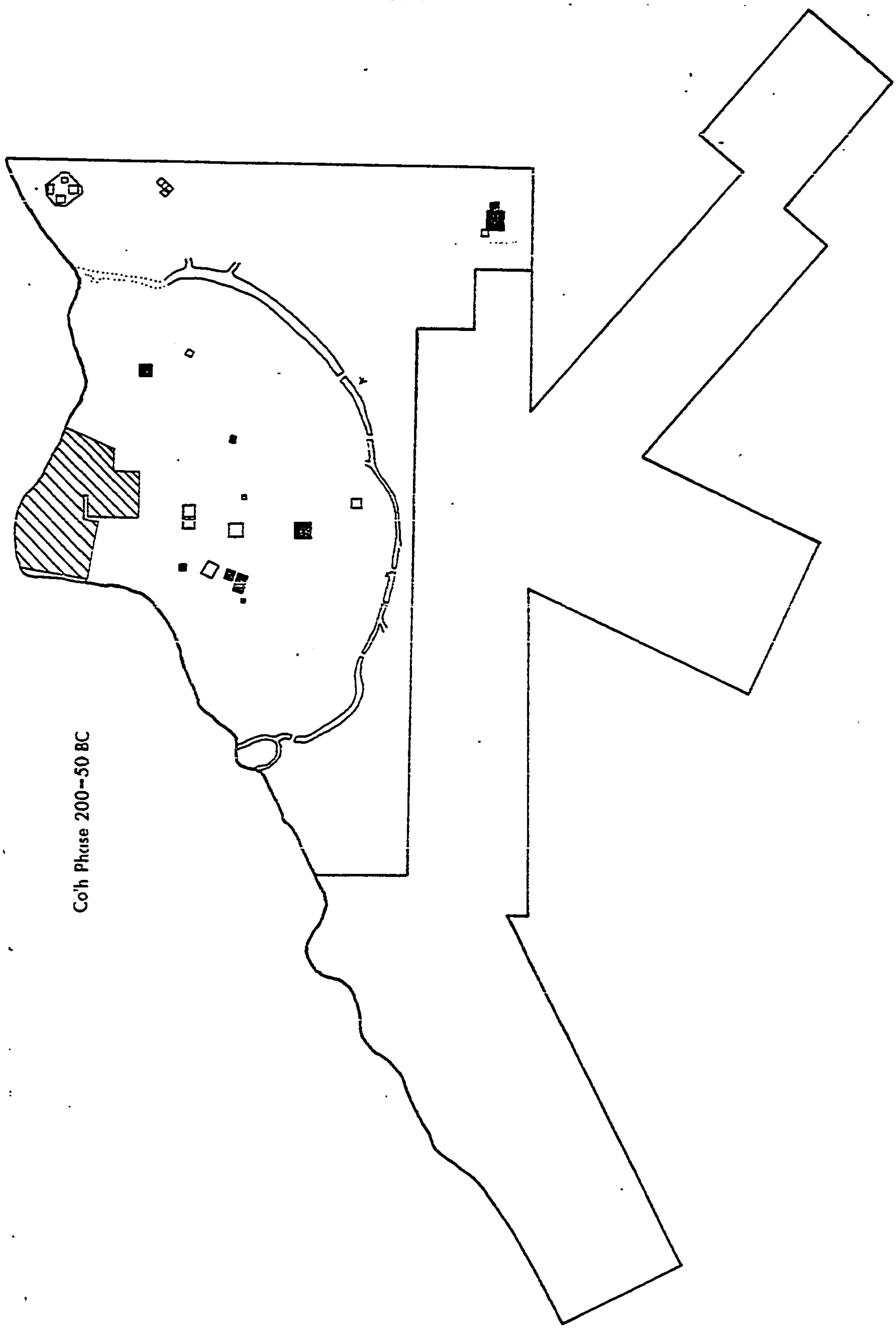


Fig. 9. Map of Co'h Phase Occupation

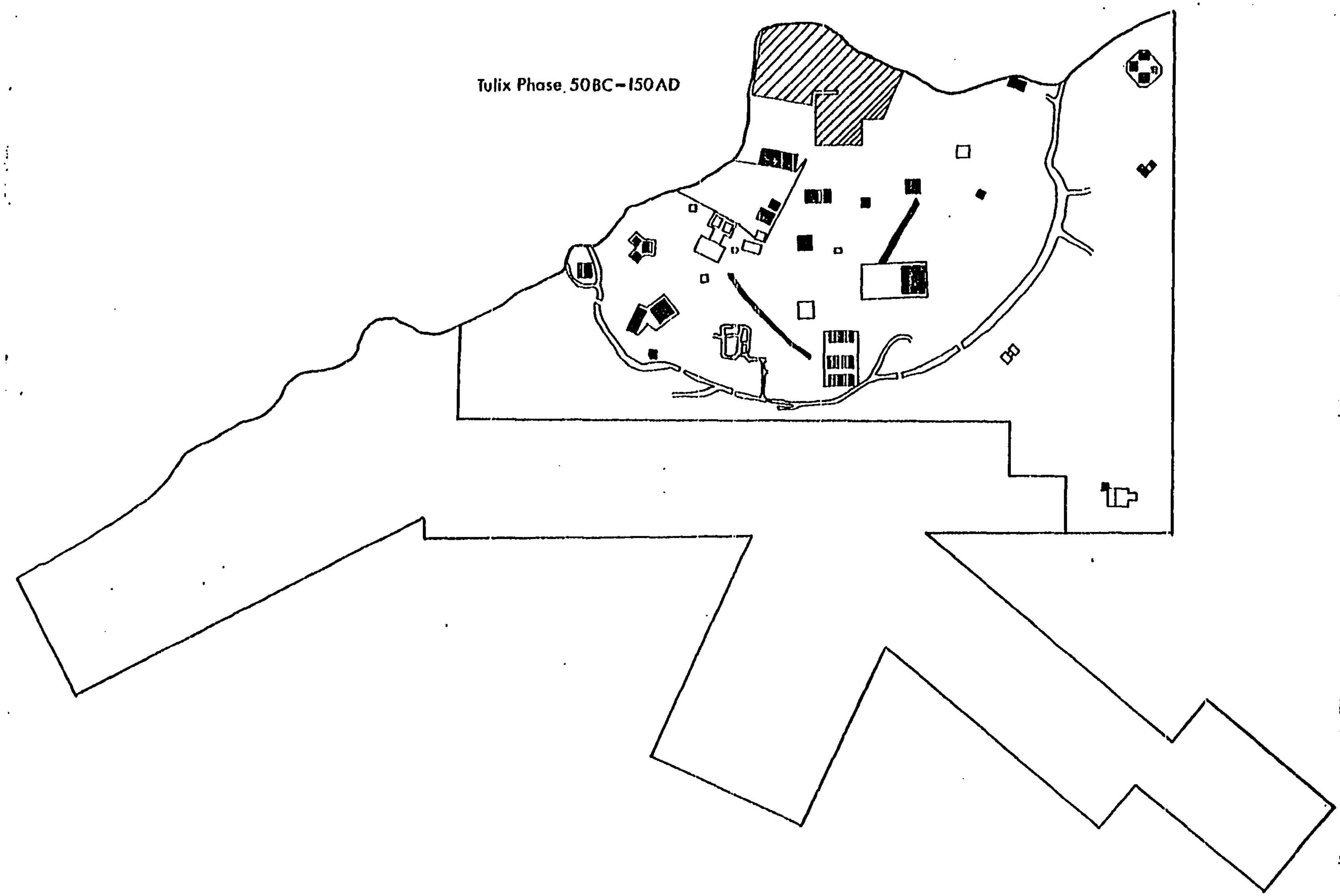


Fig. 10. Map of Tulix Phase Occupation

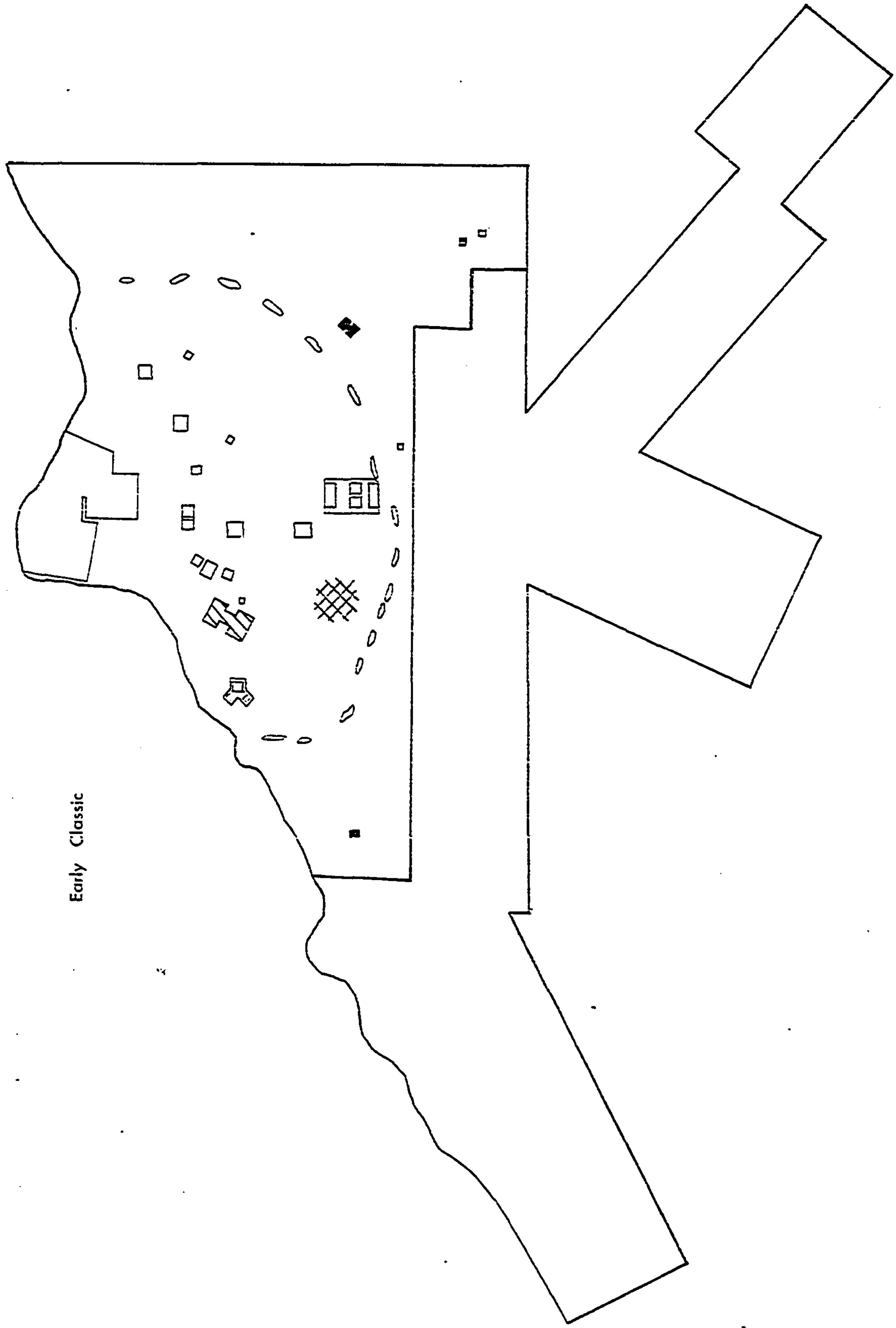


Fig. 11. Map of Early Classic Occupation

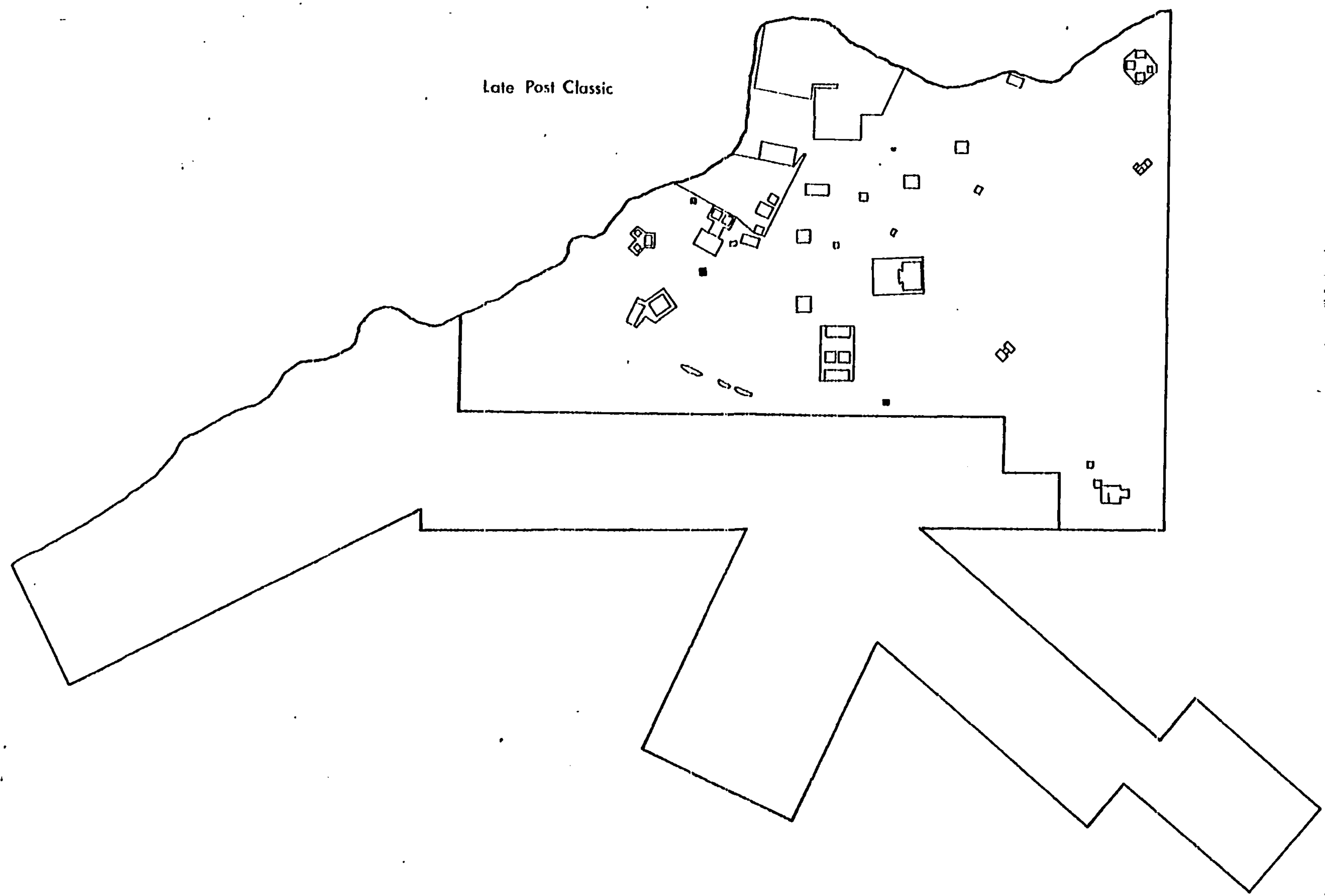


Fig. 12. Map of Late Post Classic Occupation

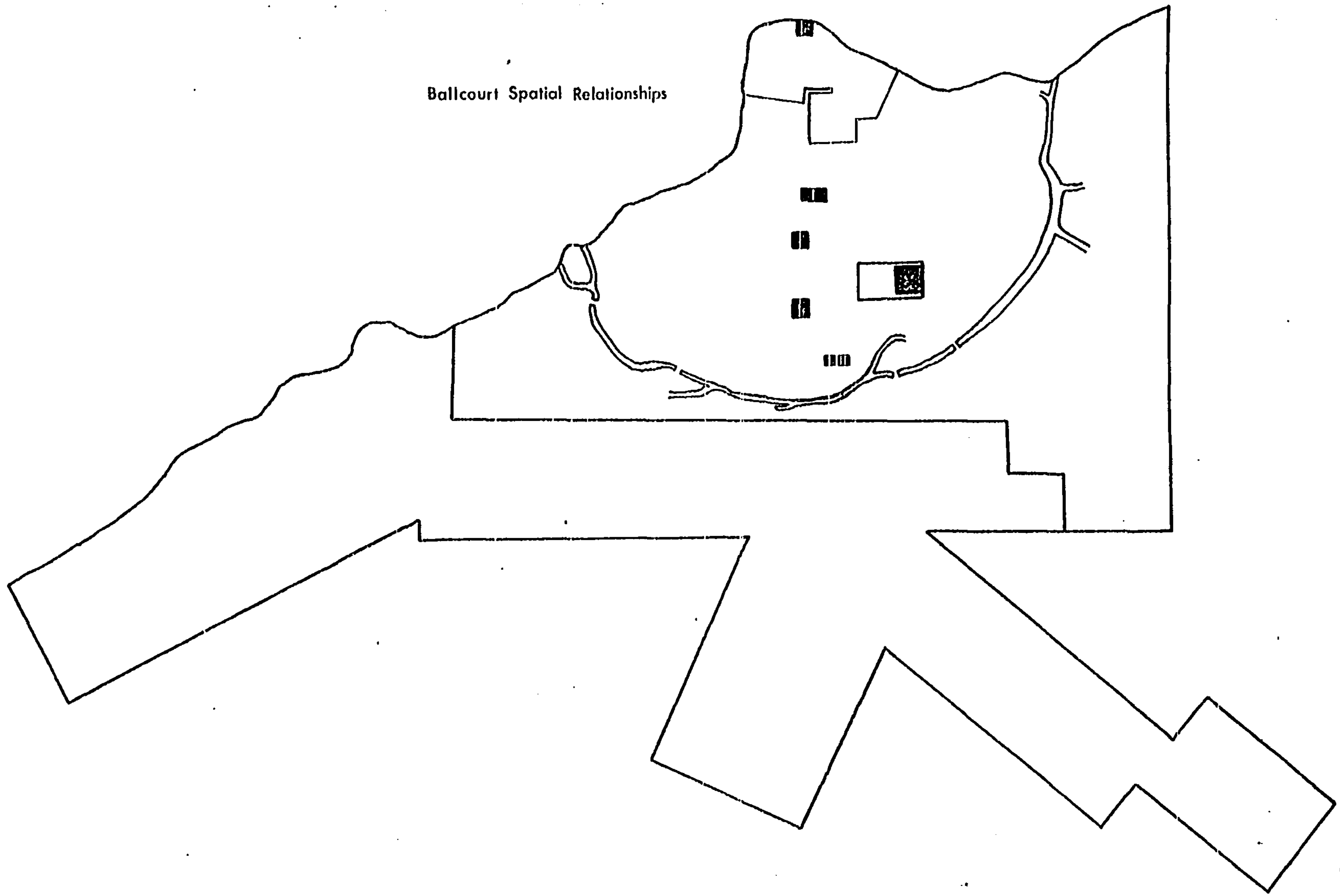


Fig. 13. Map of Ballcourt Spatial Relationships

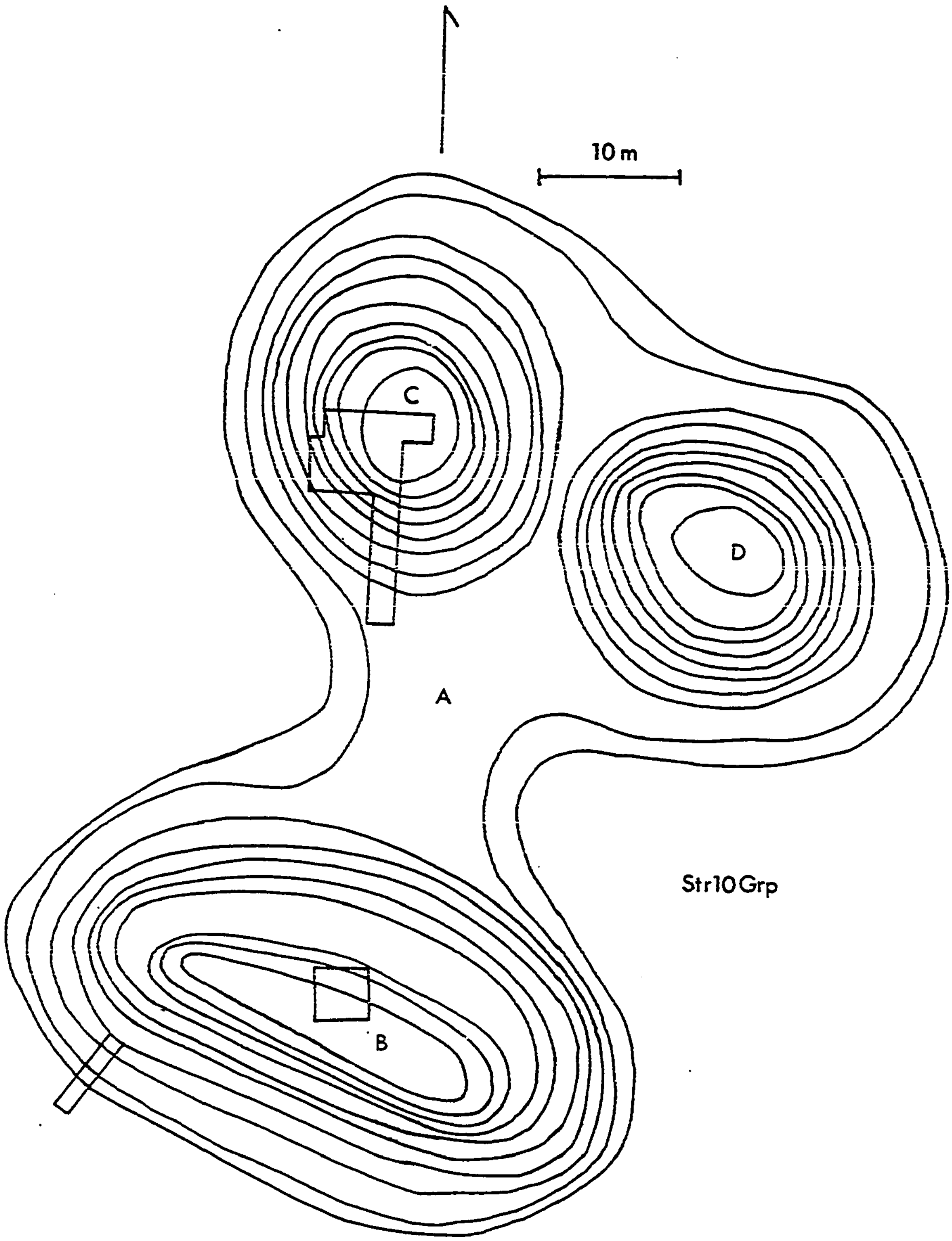


Fig. 14. Contour Map of the Structure 10 Group

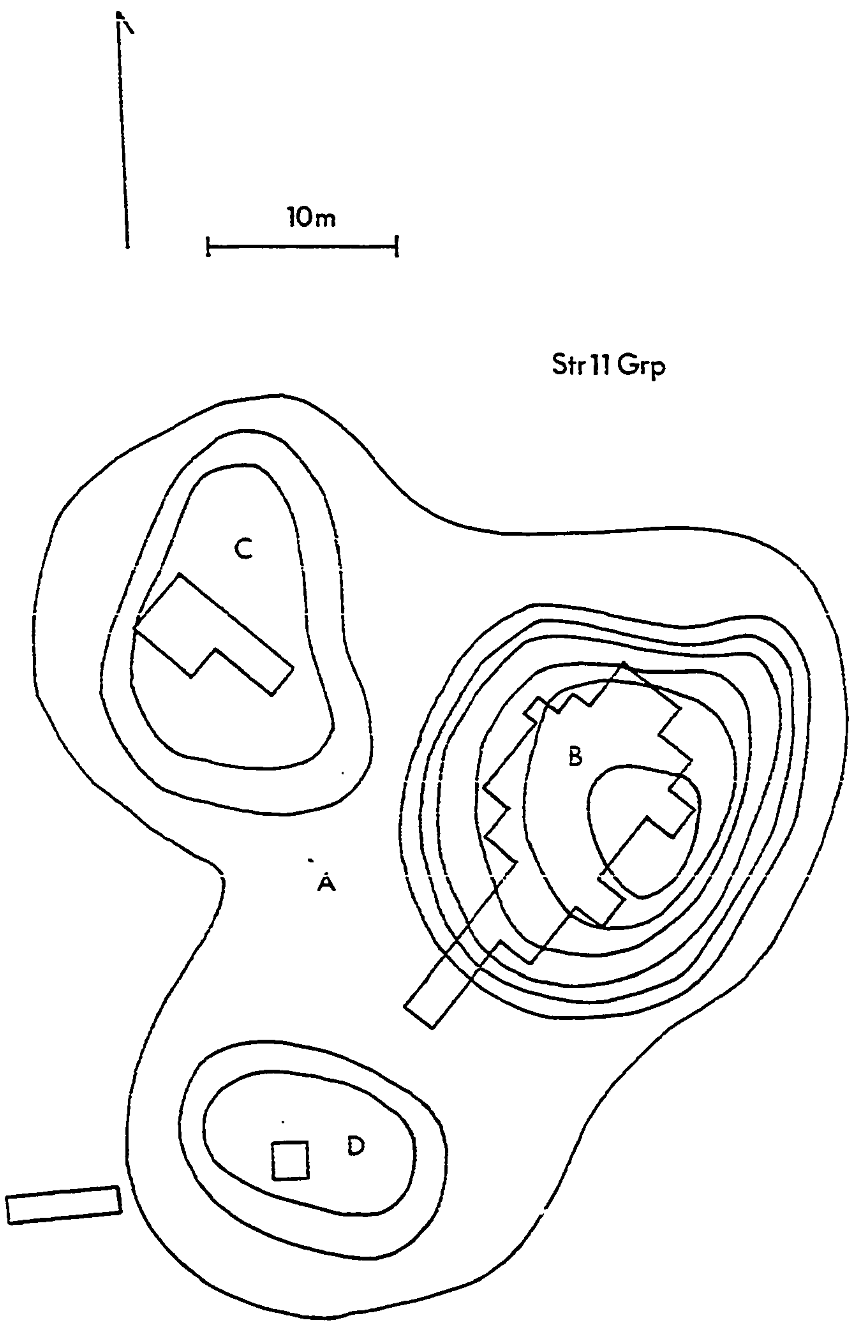


Fig. 15. Contour Map of the Structure 11 Group

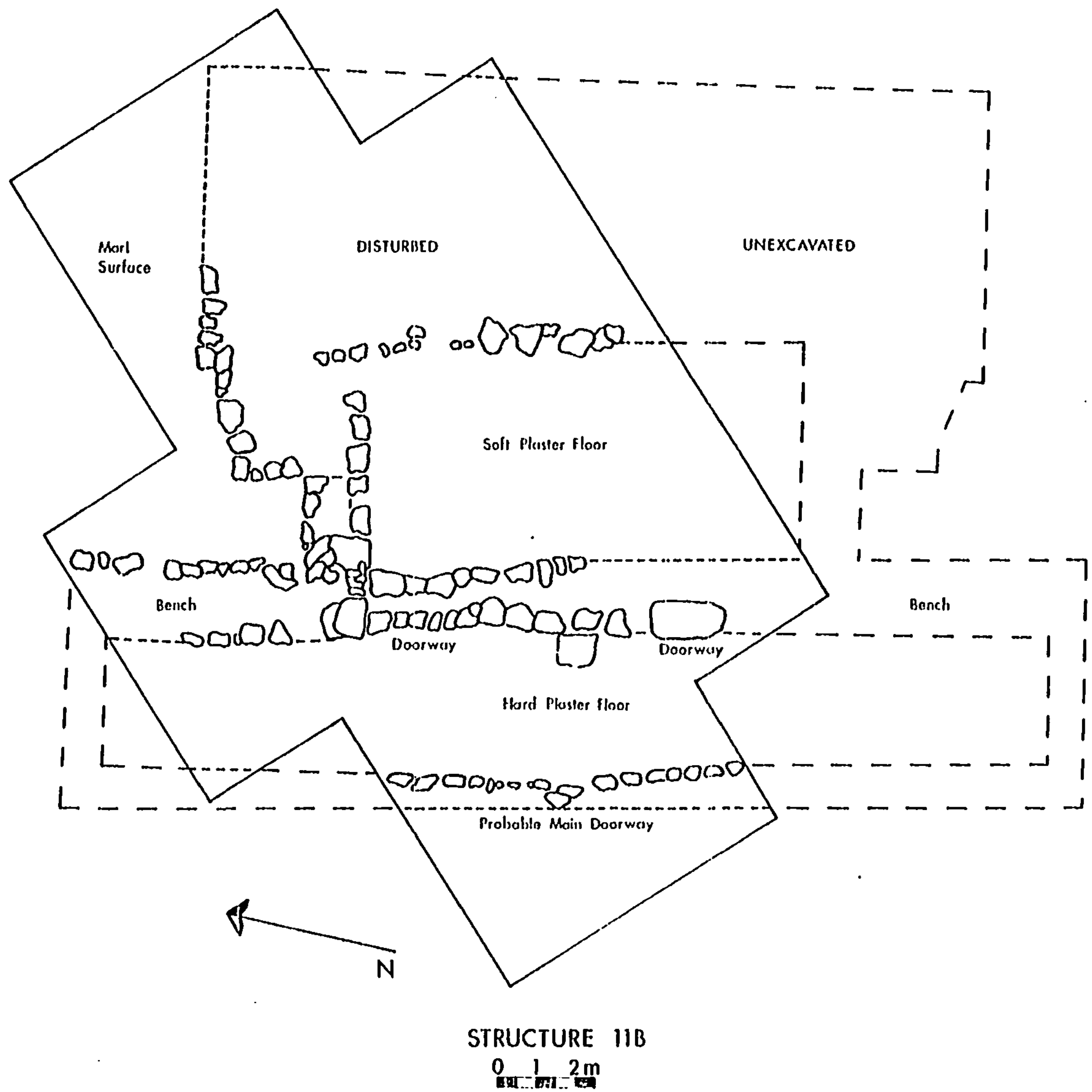


Fig. 16. Plan Map of Structure 11B

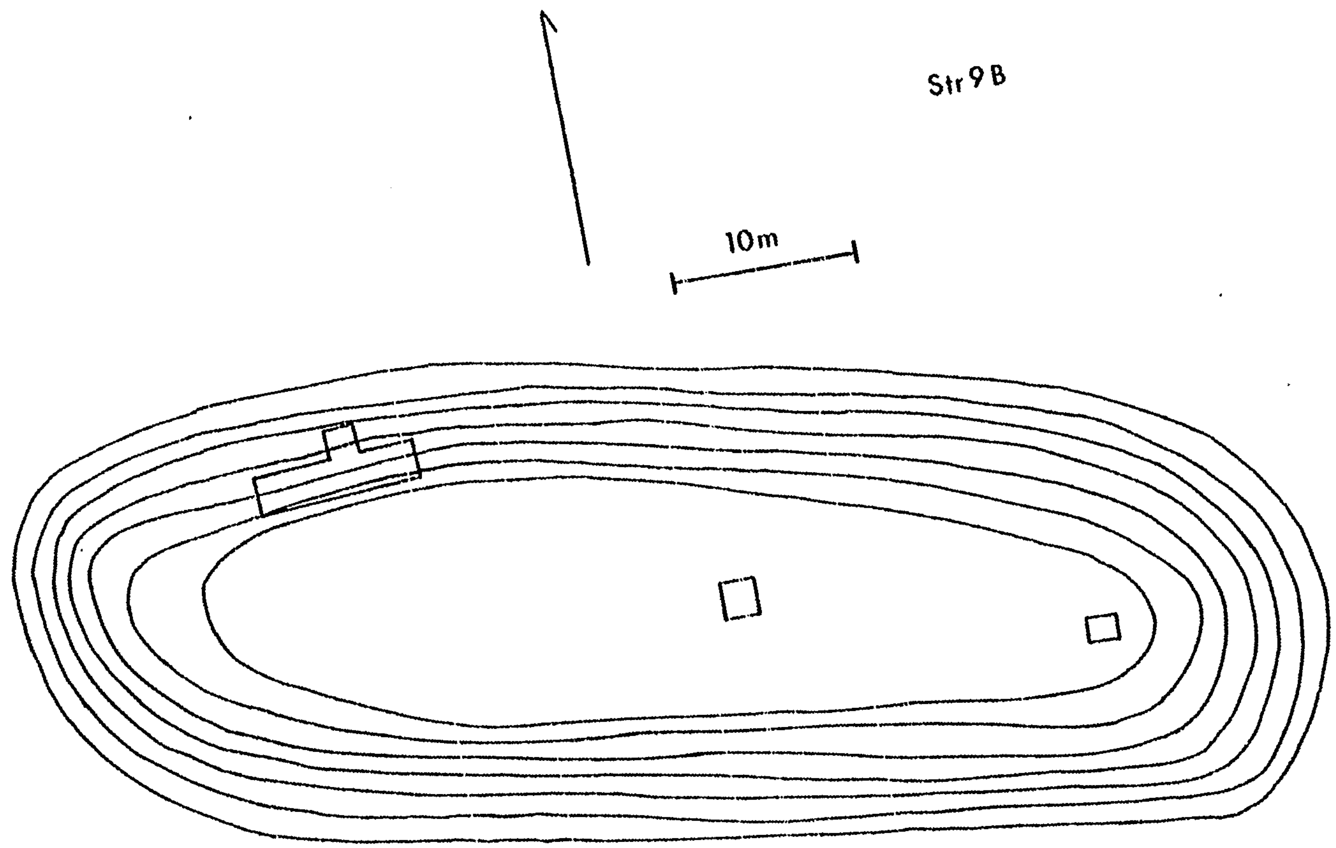


Fig. 17. Contour Map of Structure 9B

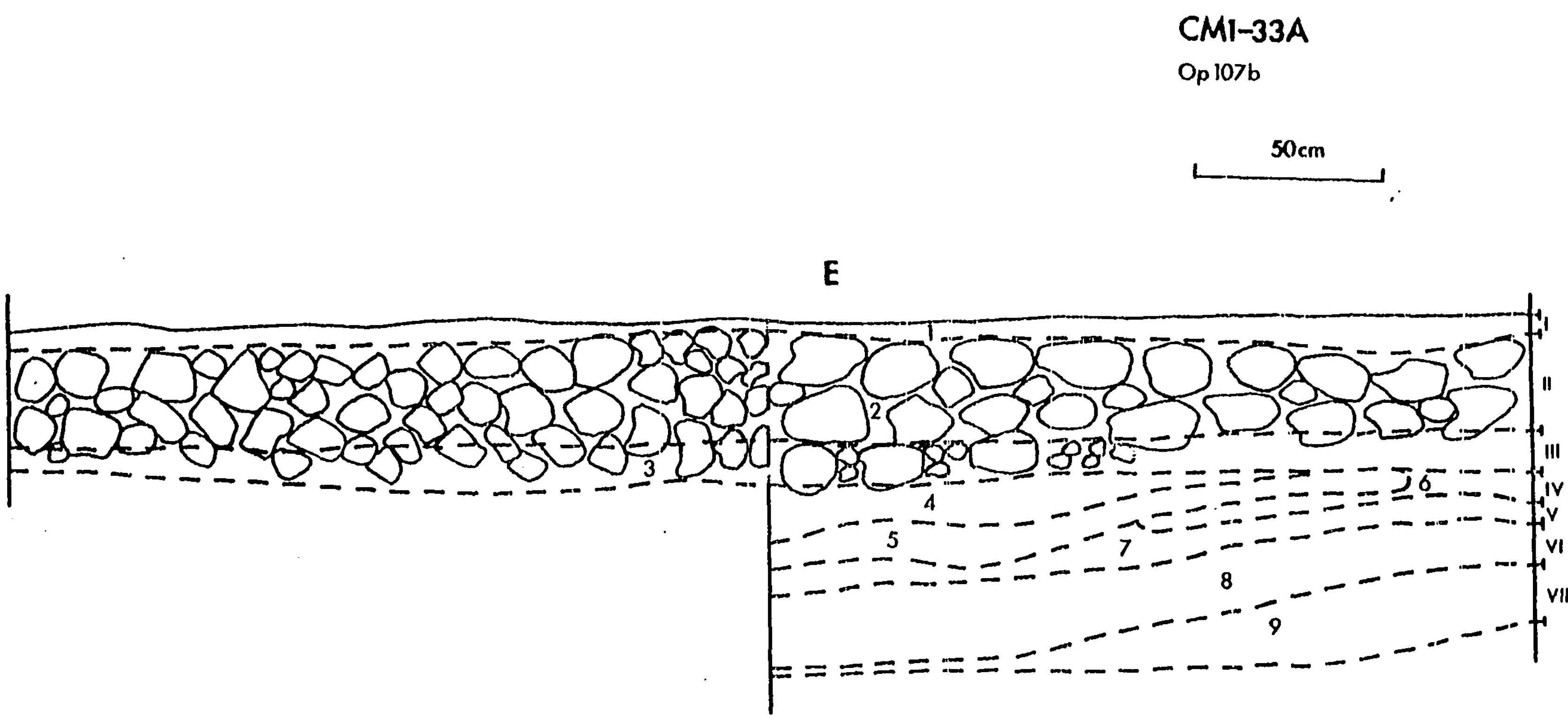


Fig. 18. Profile from Structure 9A/Feature 33A (Operation 107)

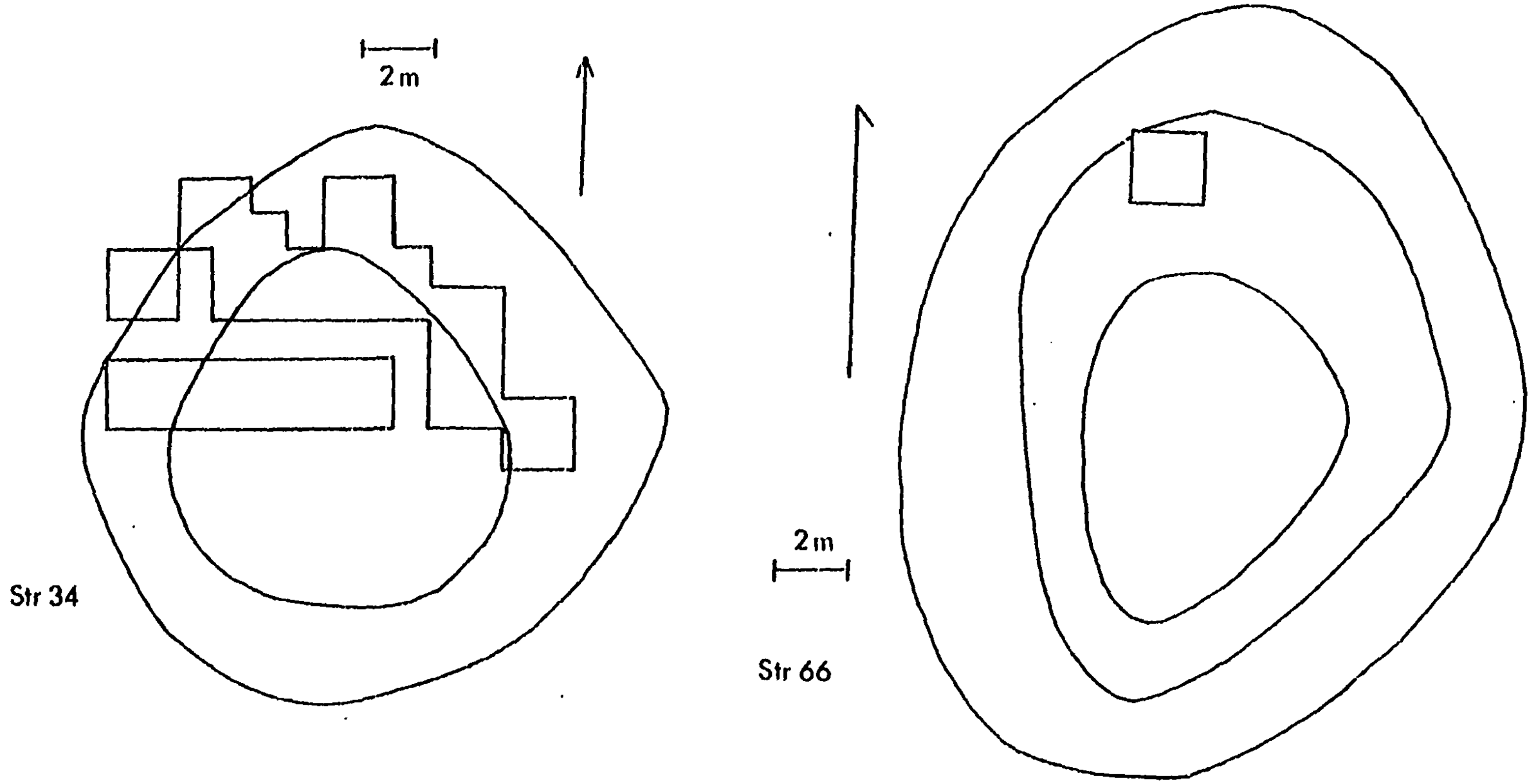


Fig. 19. Contour Map of Structures 34 and 66

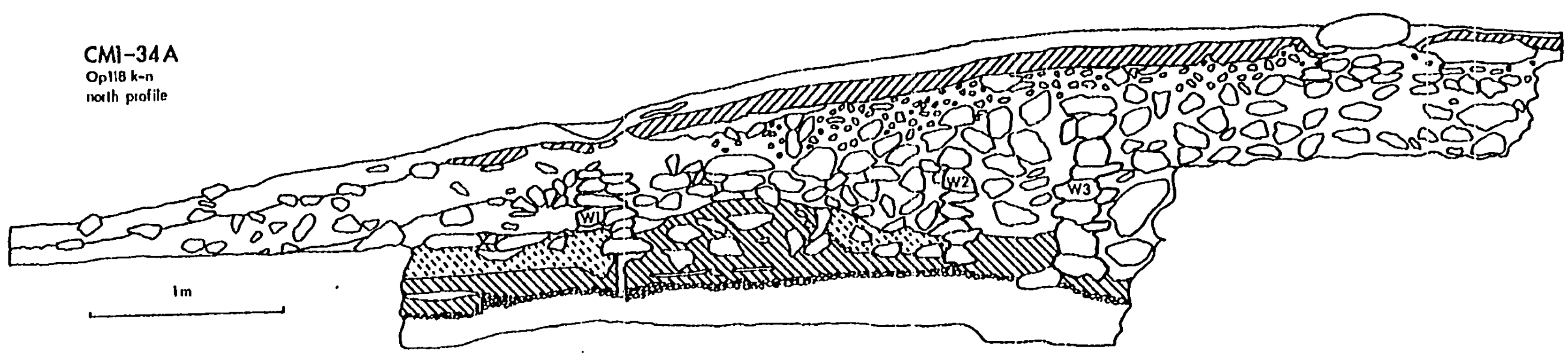


Fig. 20. Profile from Structure 34 (Operation 118)

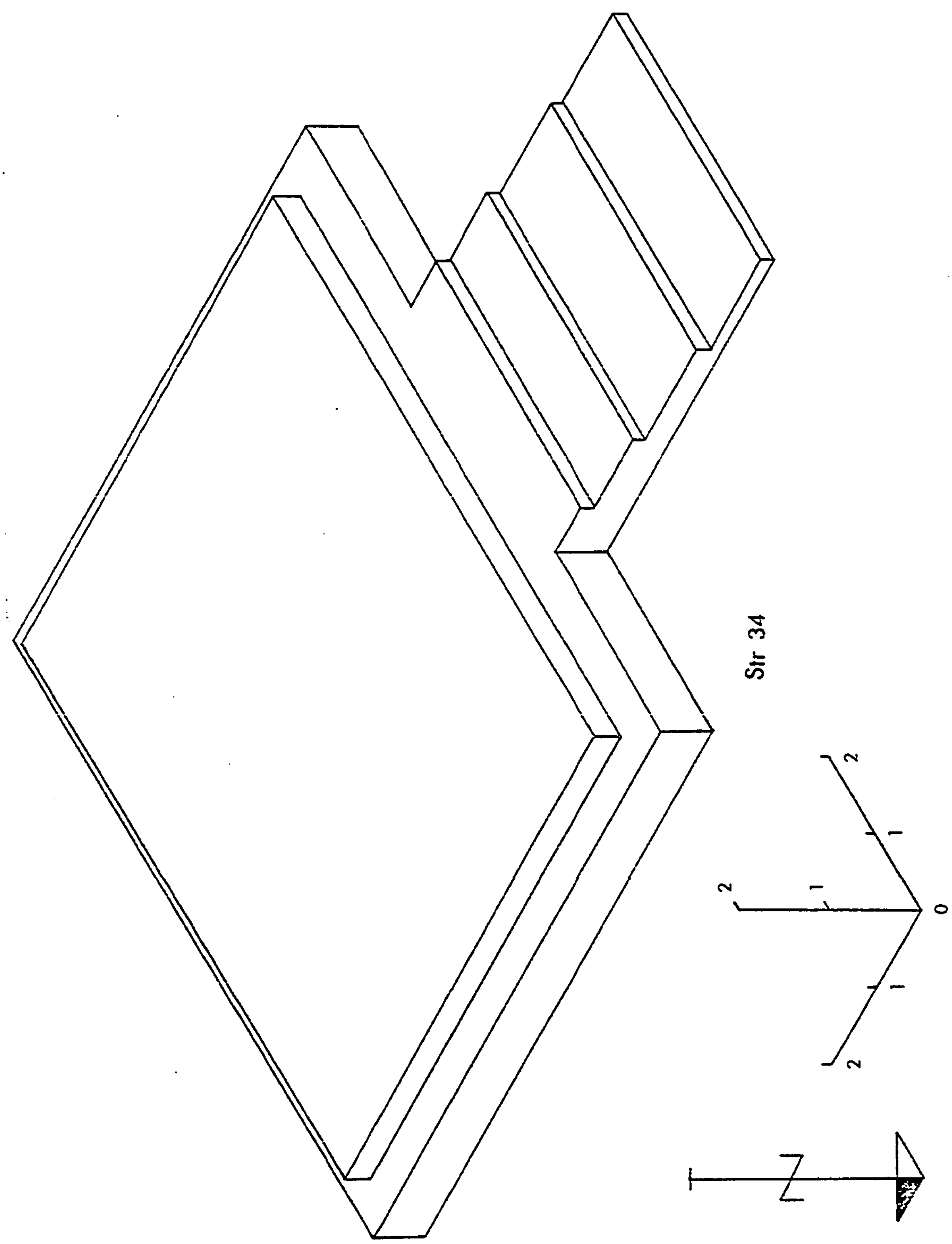


Fig. 21. Isometric Plan of Structure 34

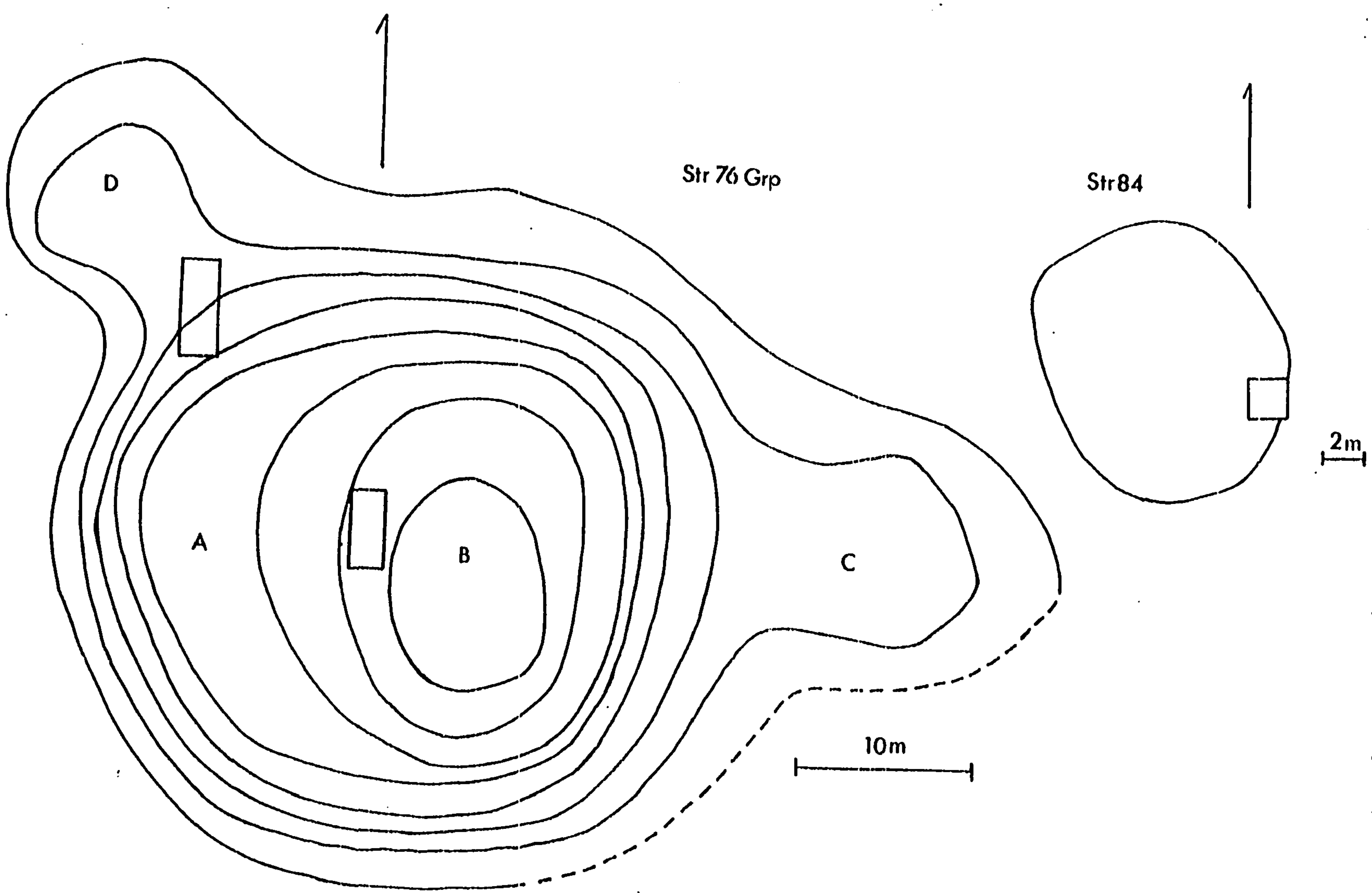


Fig. 22. Contour Map of the Structure 76 Group and Structure 84

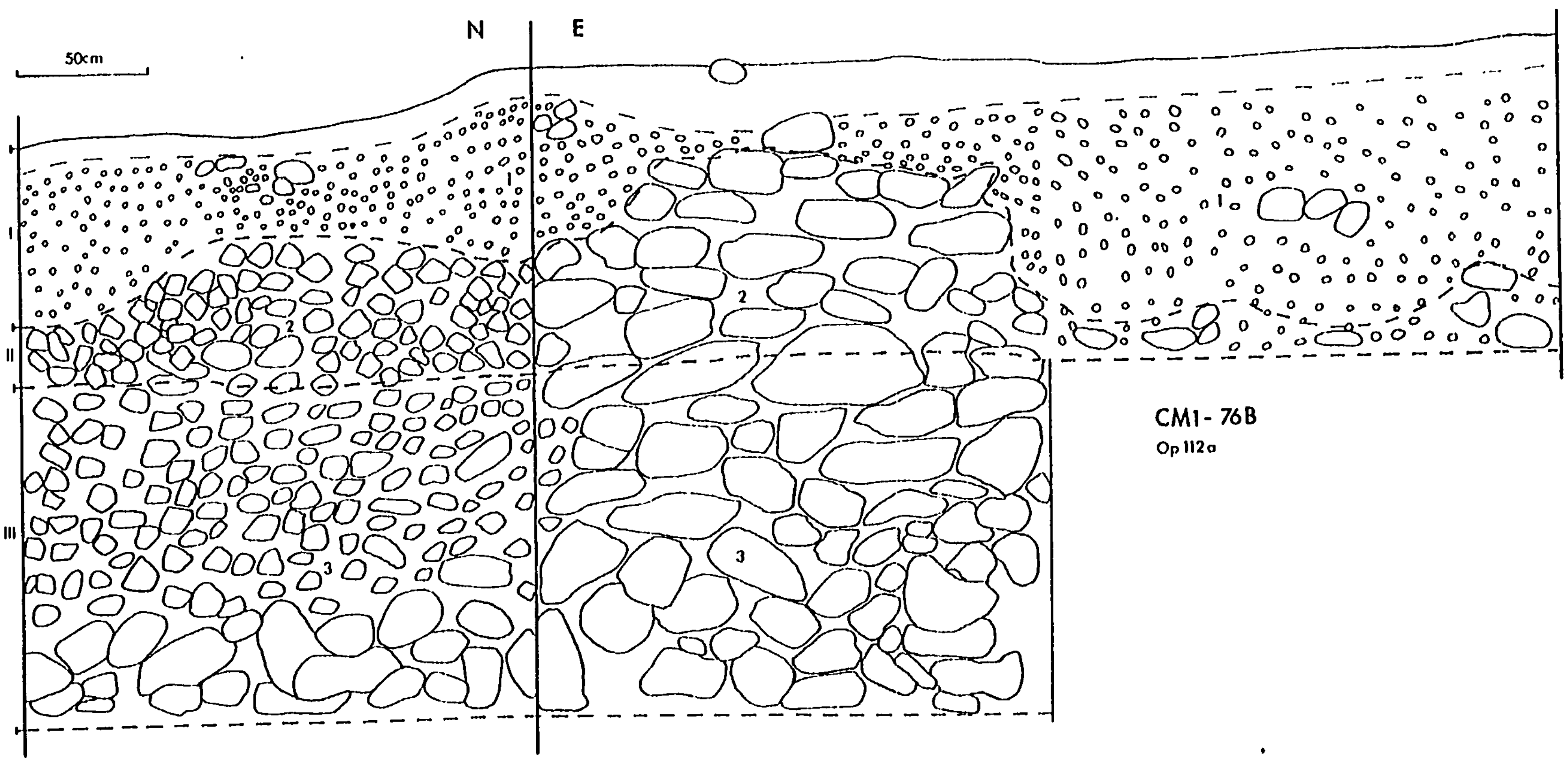


Fig. 23. Profile from Structure 76B (Operation 112)

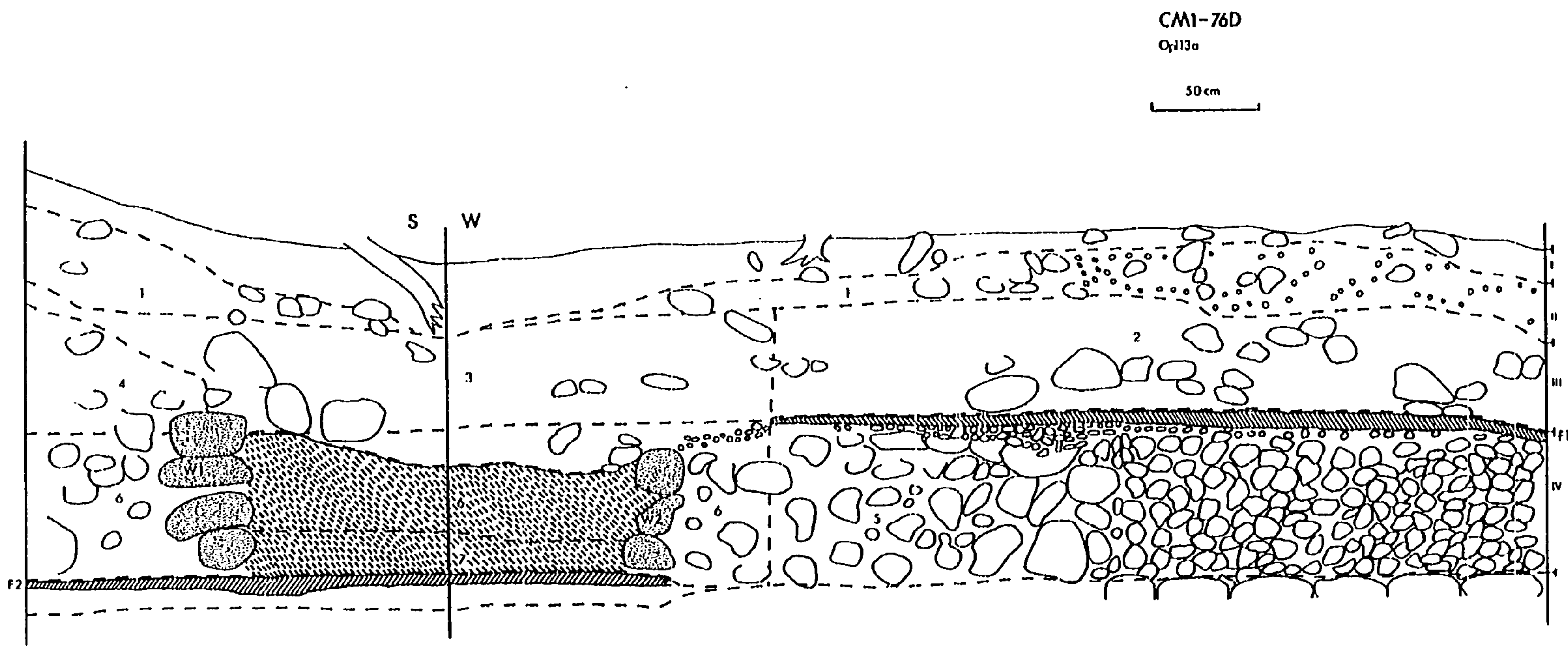


Fig. 24. Profile from Structure 76D (Operation 113)

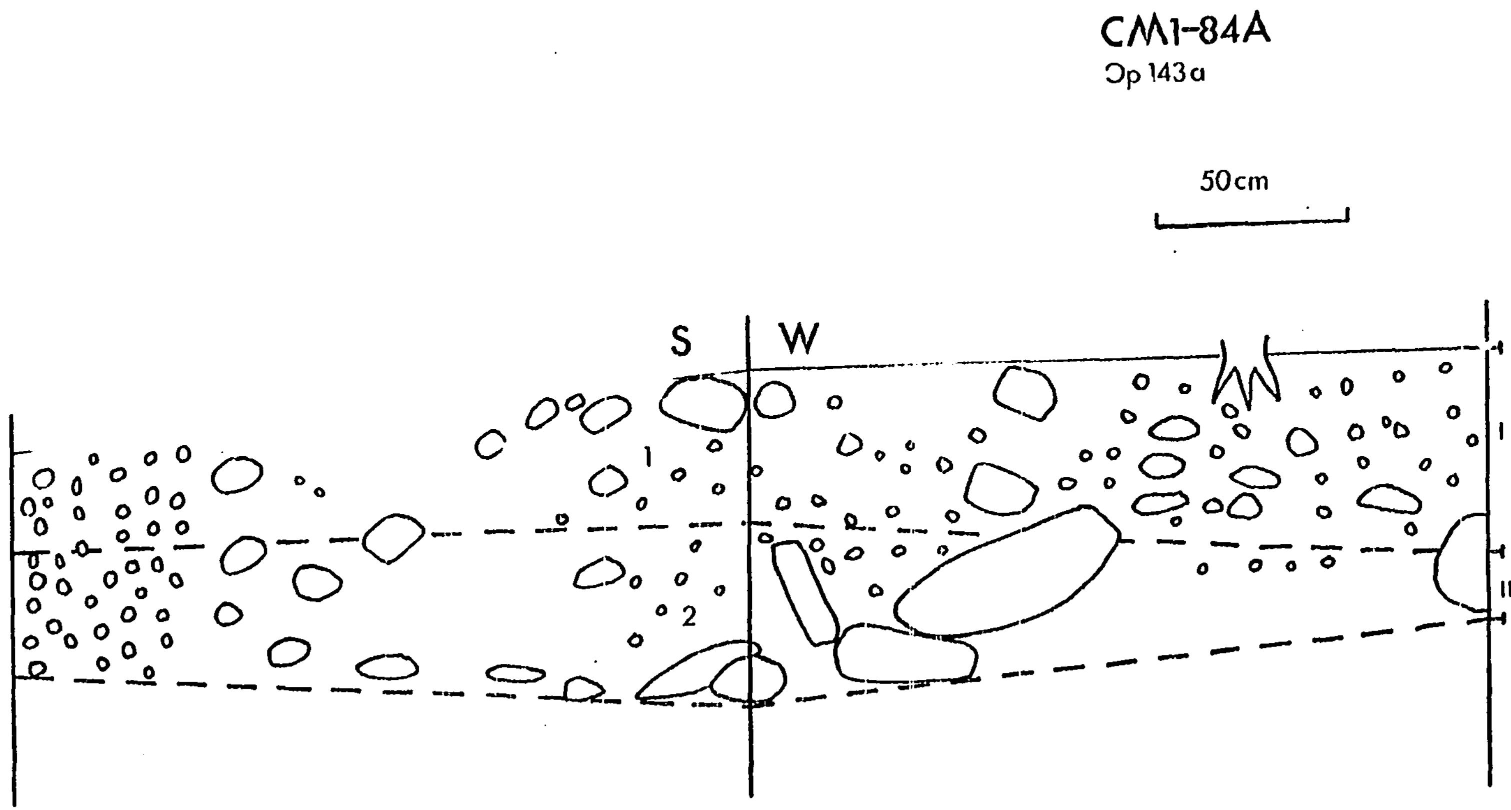


Fig. 25. Profile from Structure 84 (Operation 143)

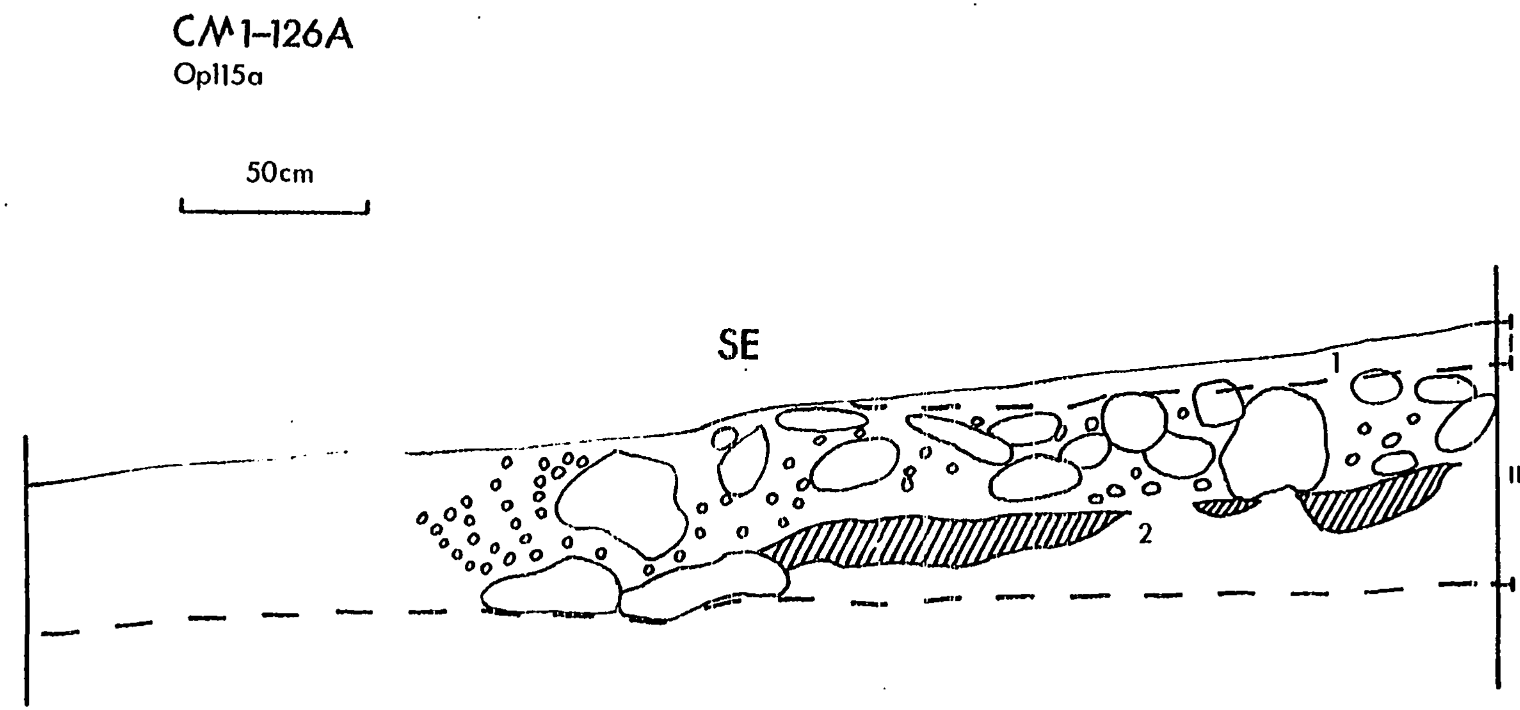


Fig. 26. Profile from Feature 126 (Operation 115)

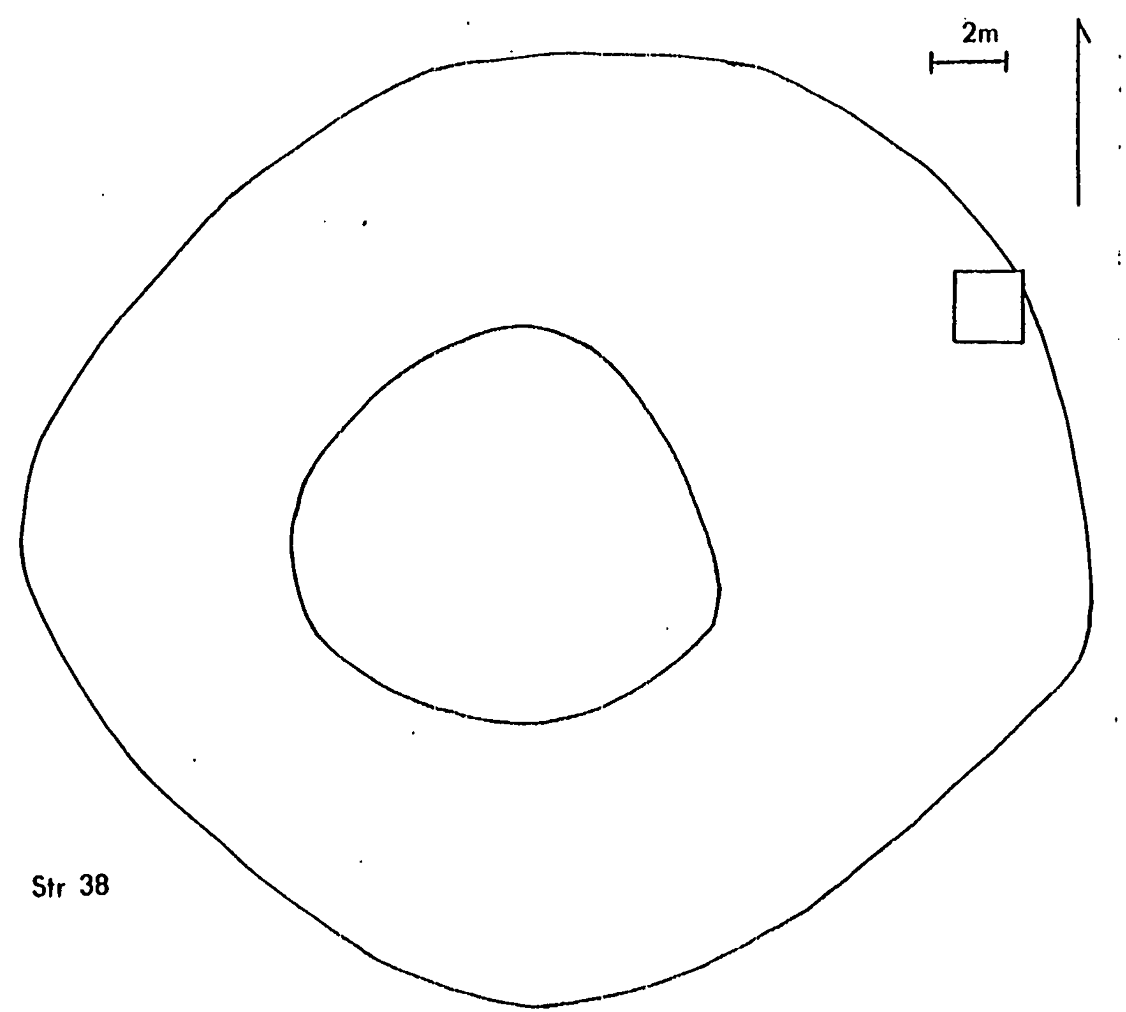


Fig. 27. Contour Map of Structure 38

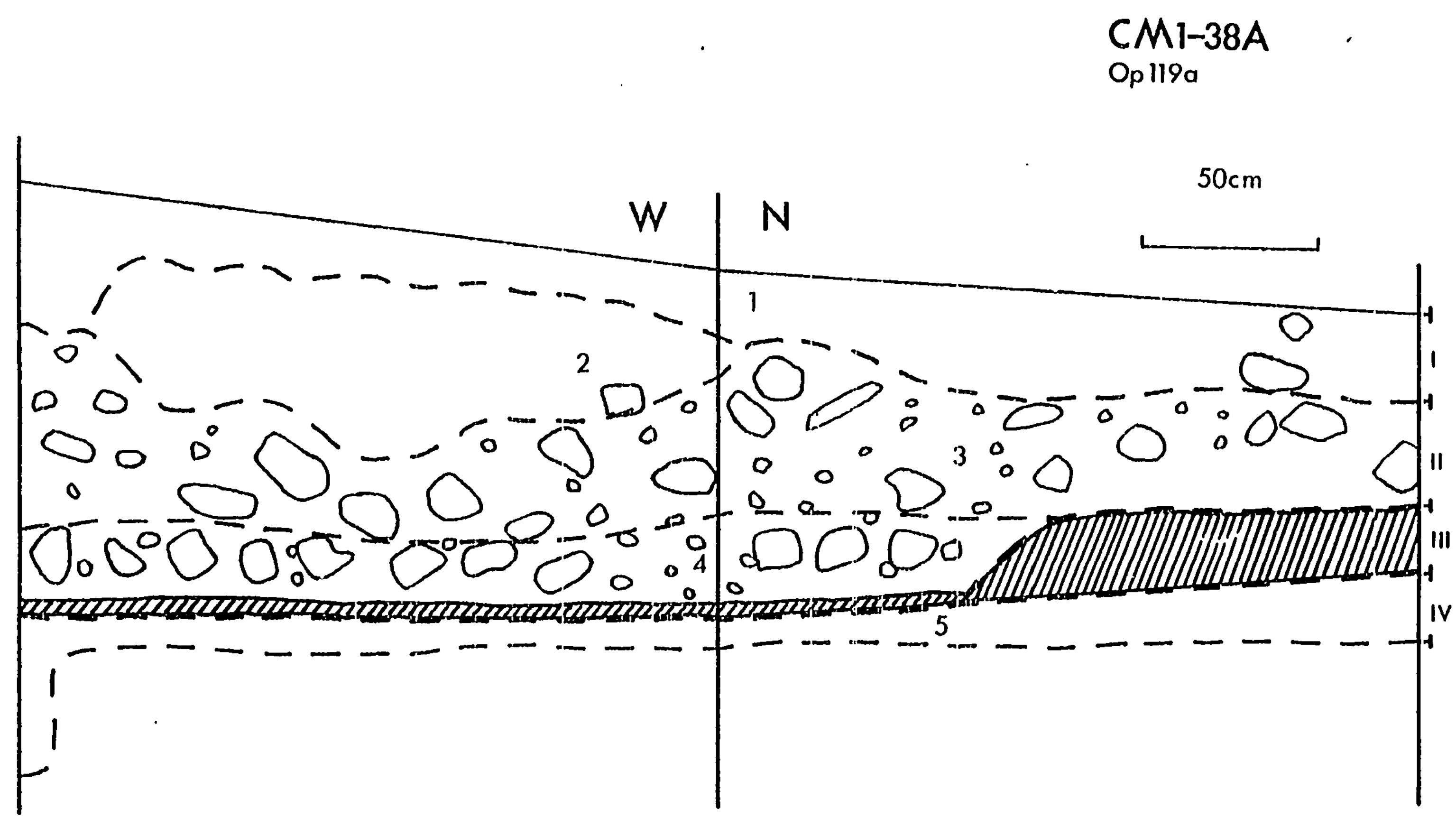


Fig. 28. Profile from Structure 38 (Operation 119)

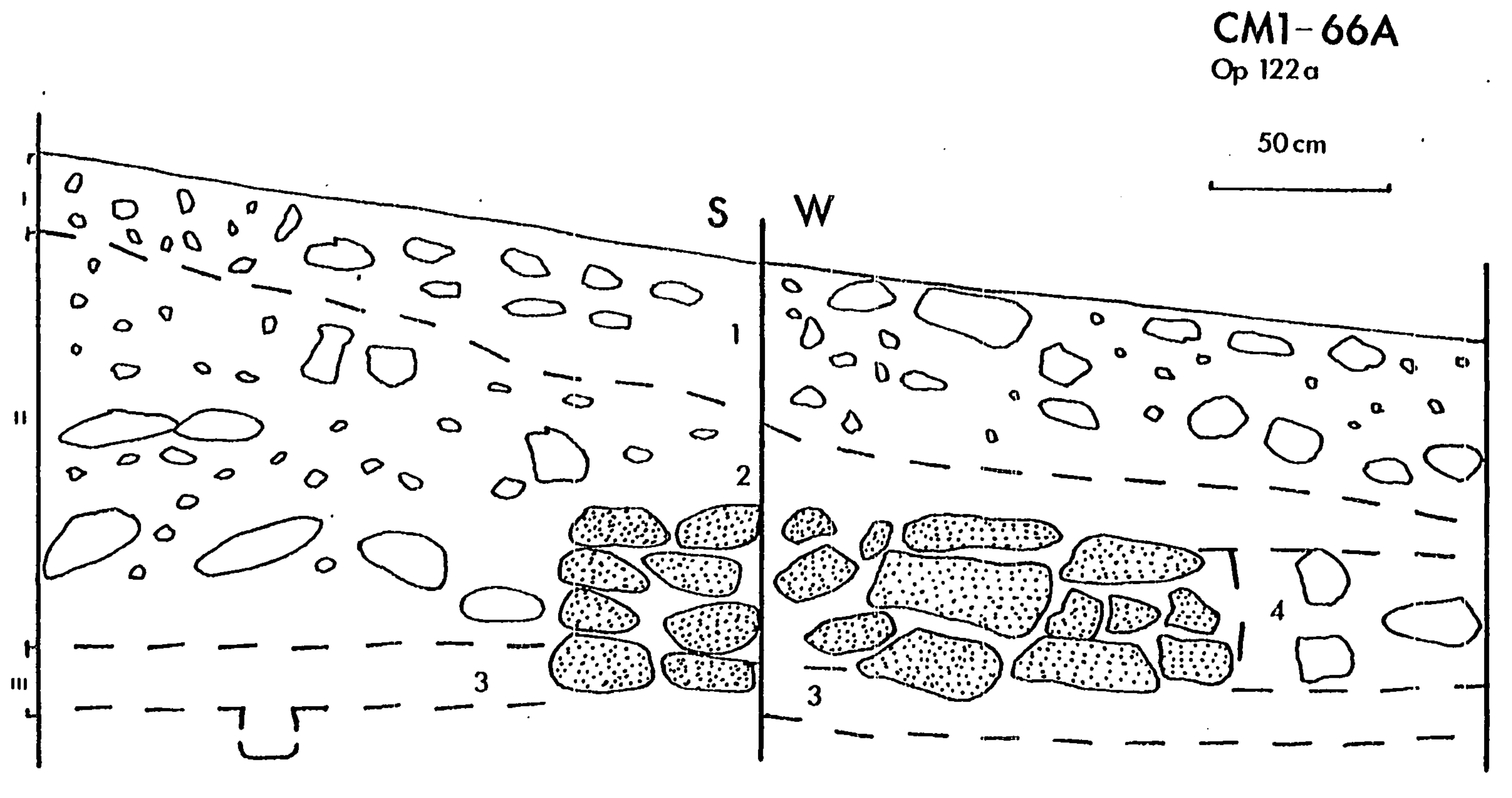


Fig. 29. Profile from Structure 66 (Operation 122)

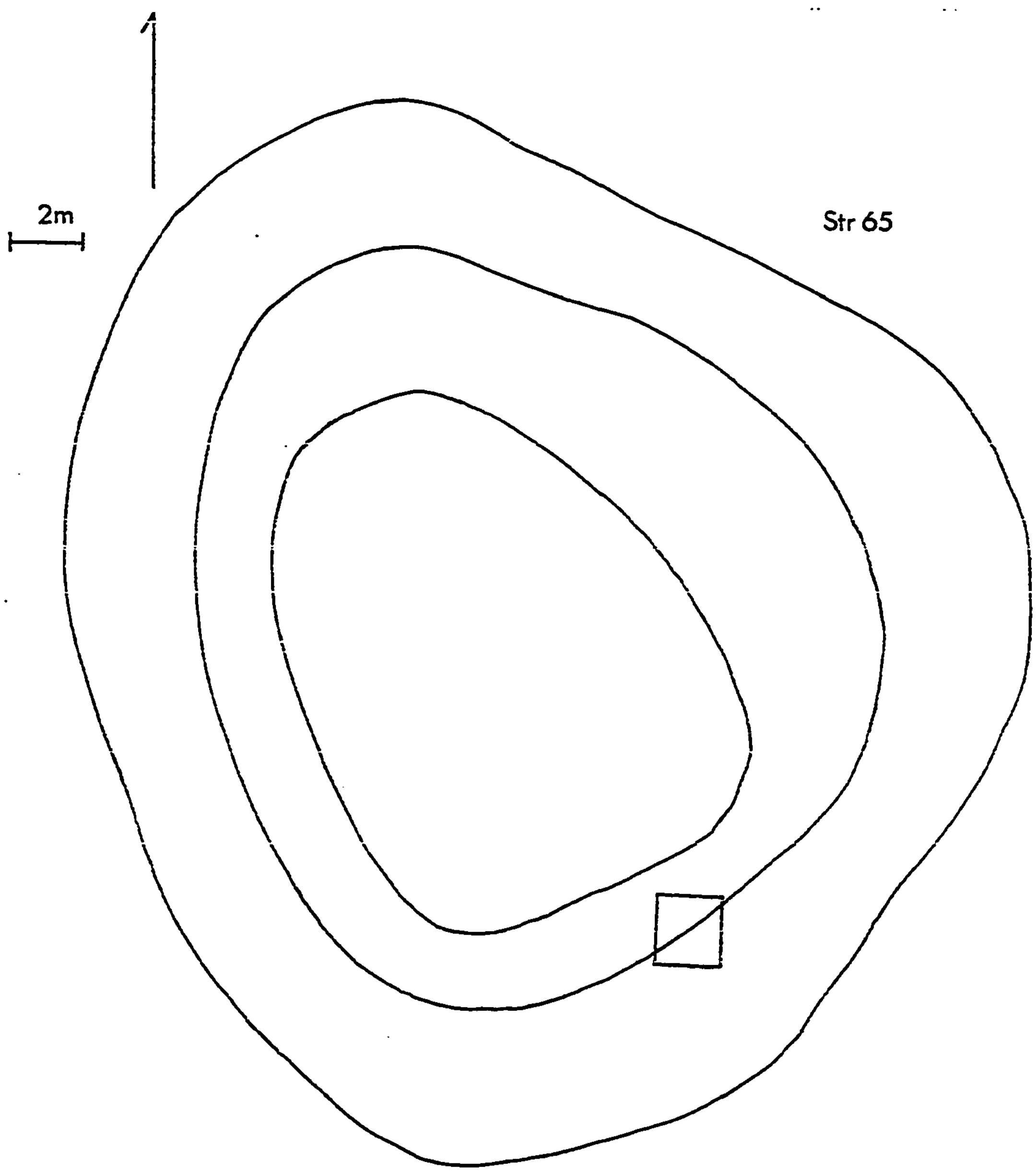


Fig. 30. Contour Map of Structure 65

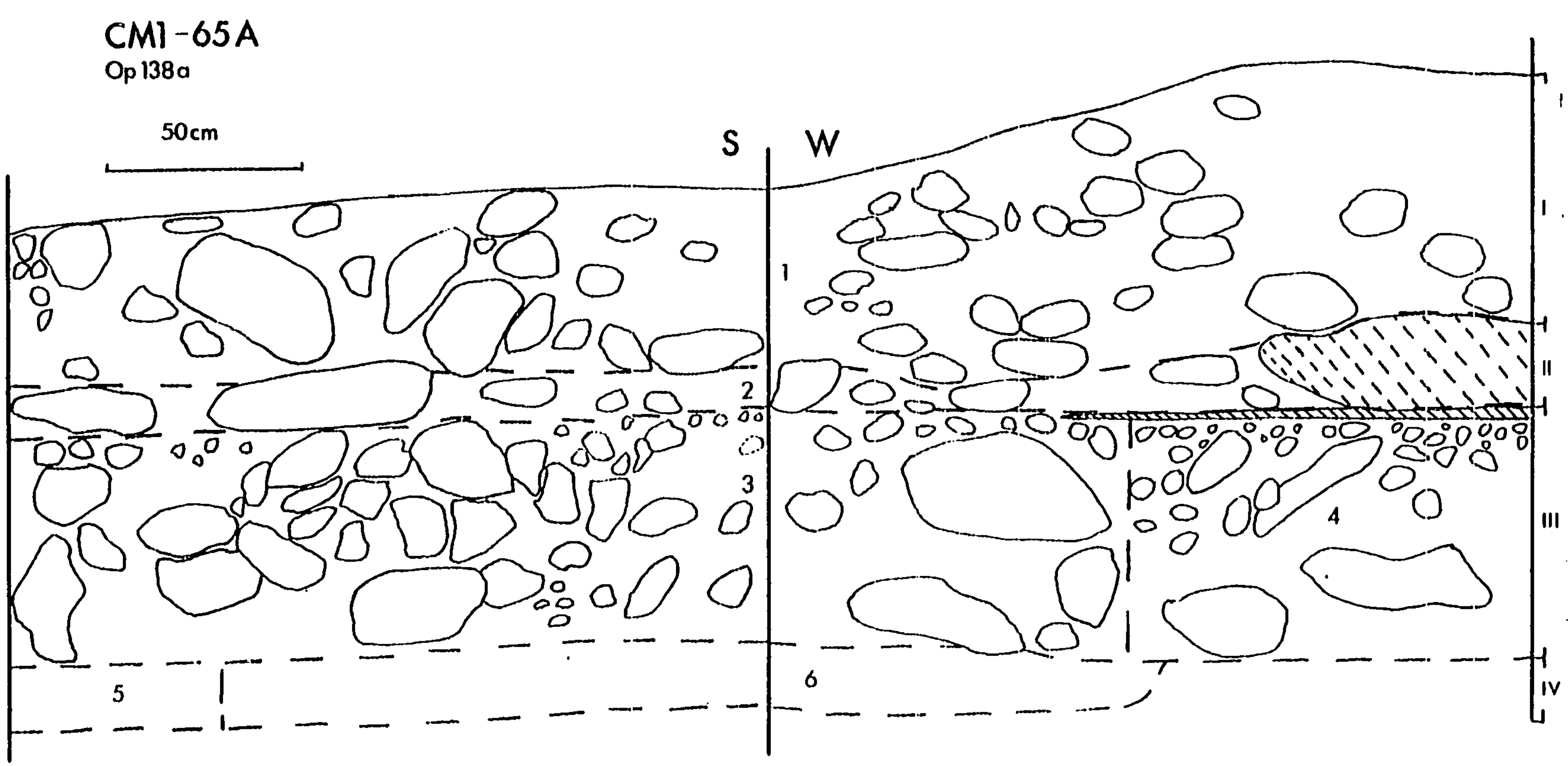


Fig. 31. Profile from Structure 65 (Operation 138)

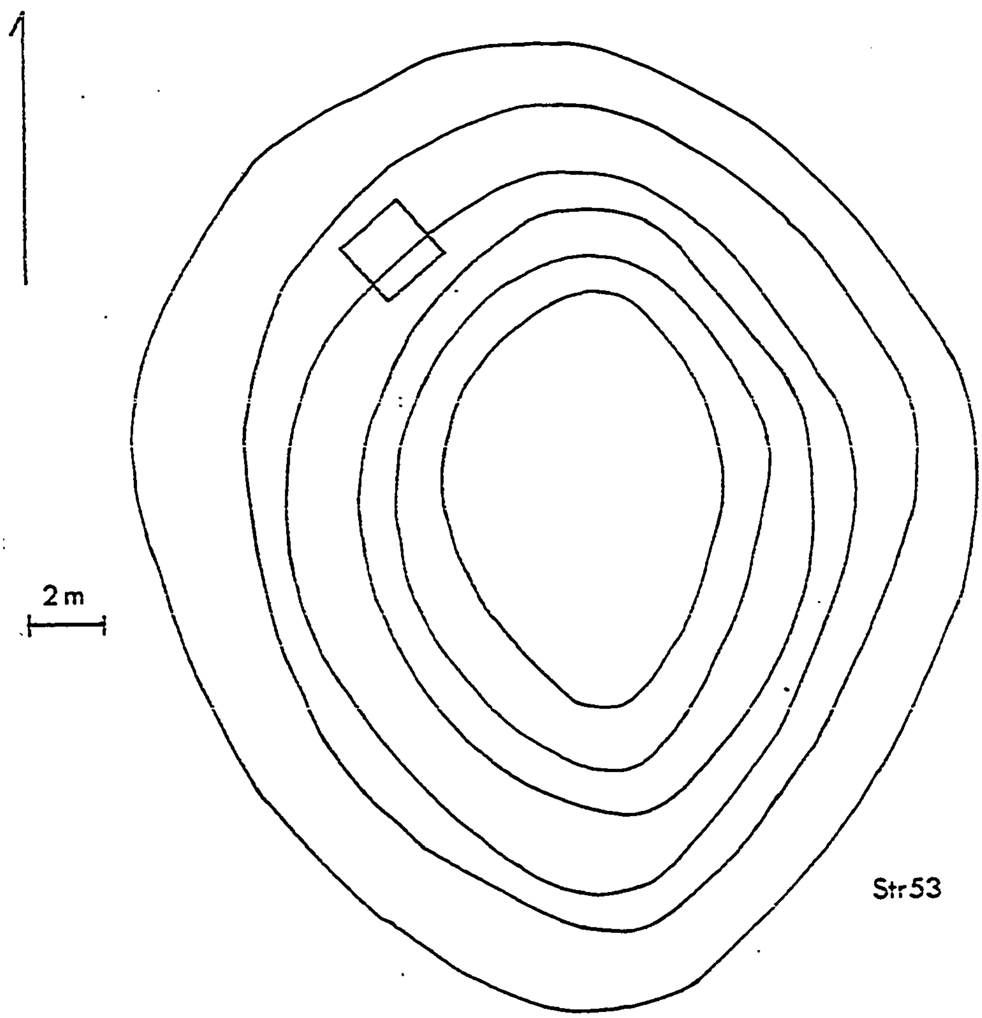


Fig. 32. Contour Map of Structure 53

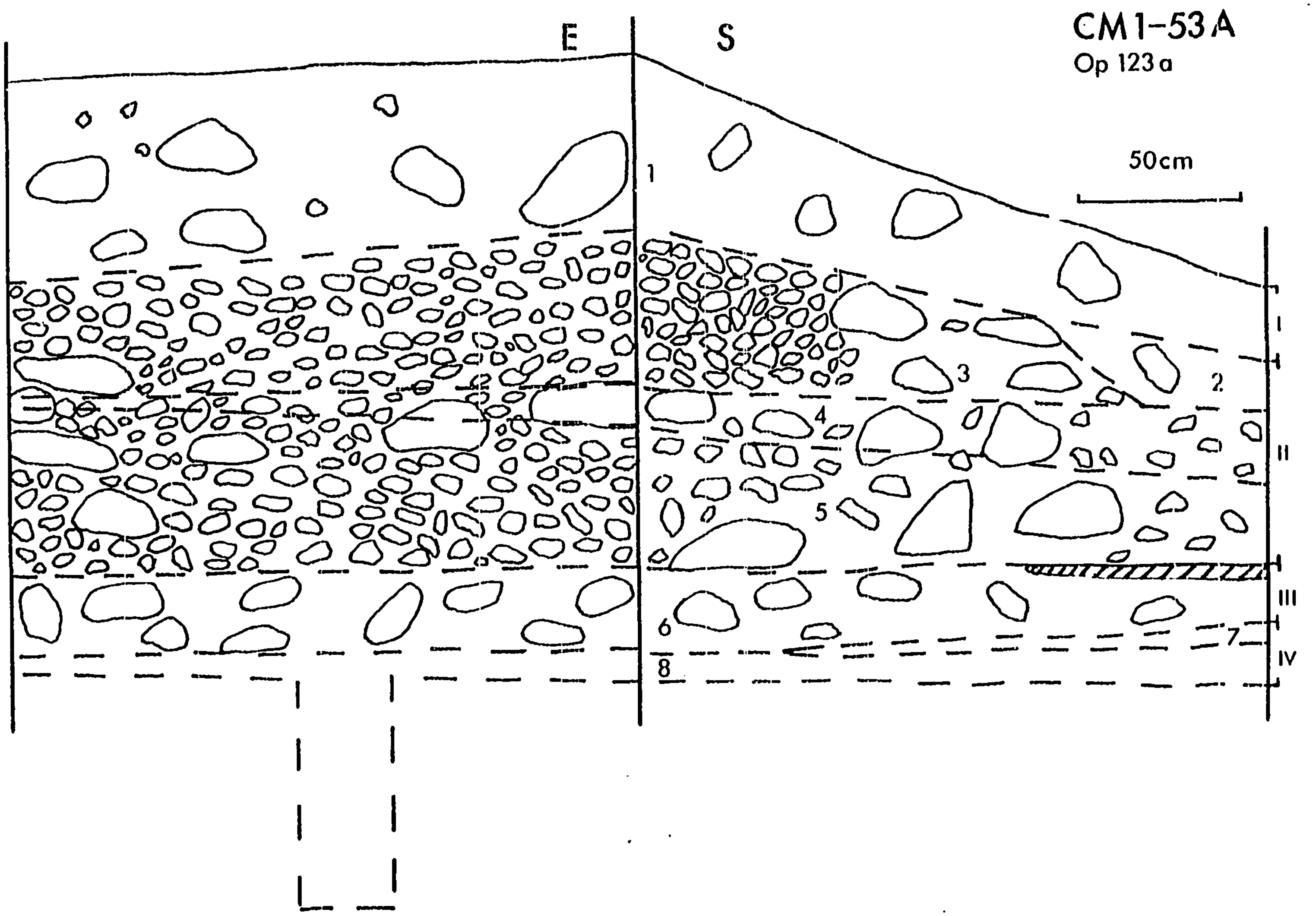


Fig. 33. Profile from Structure 53 (Operation 123)

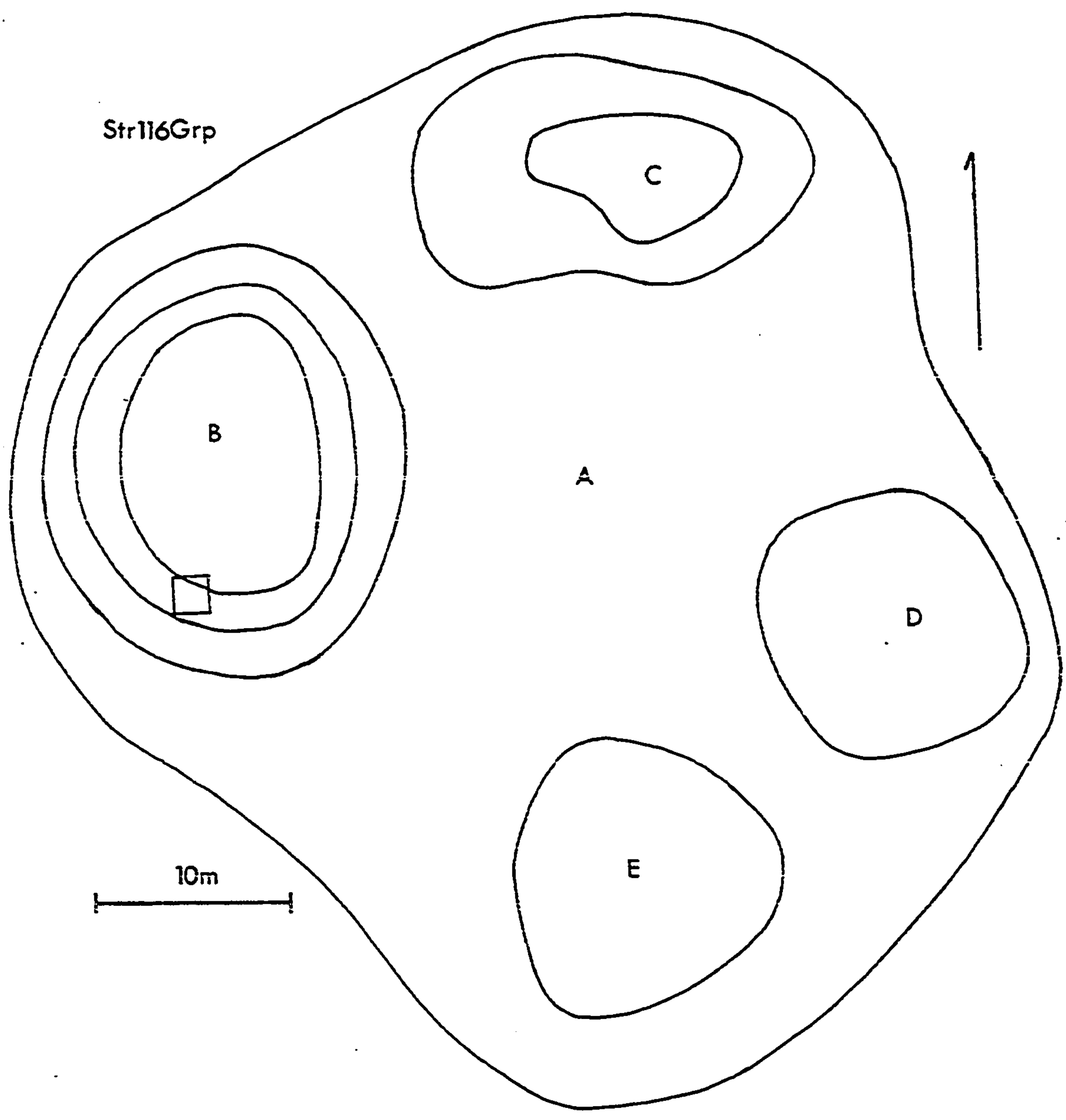
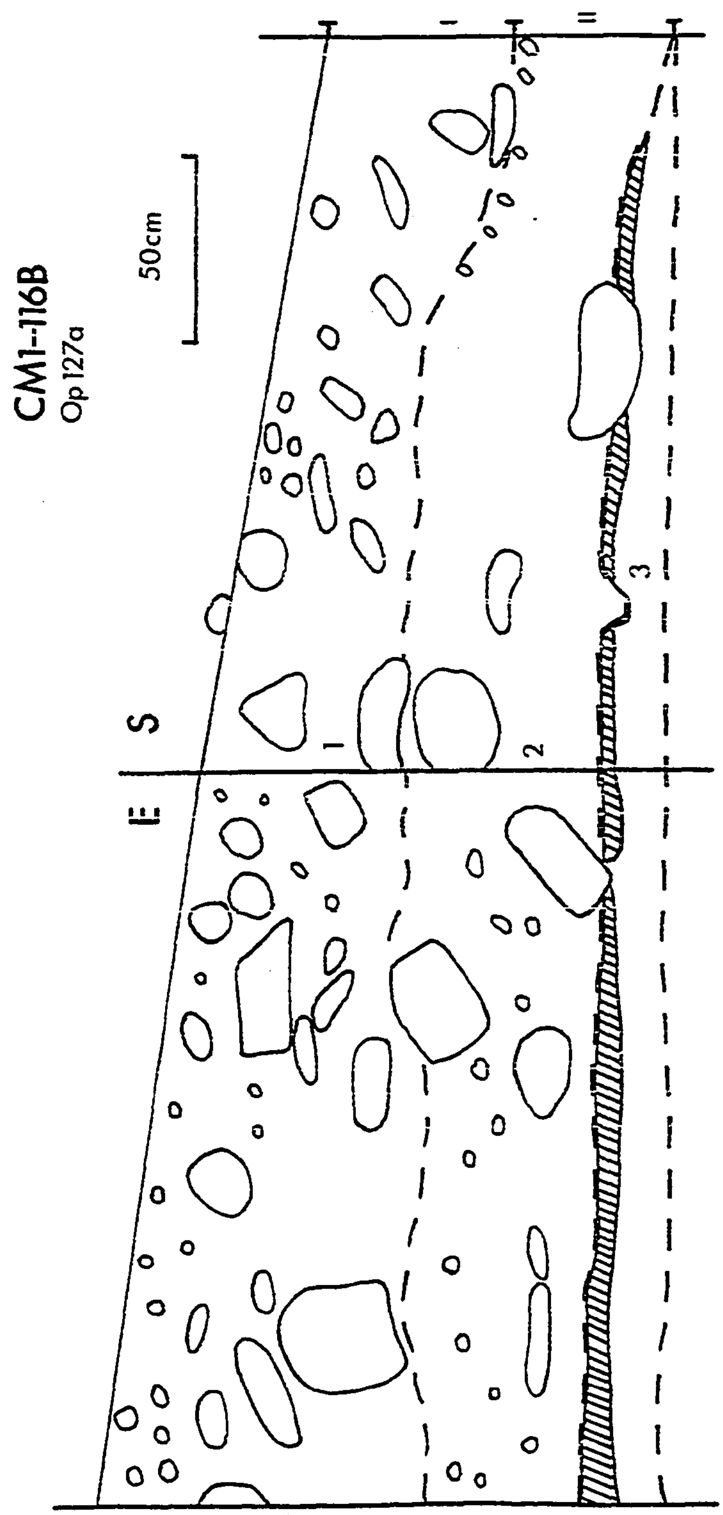


Fig. 34. Contour Map of the Structure 116 Group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Op 127a
50cm
S
E
1
2
3

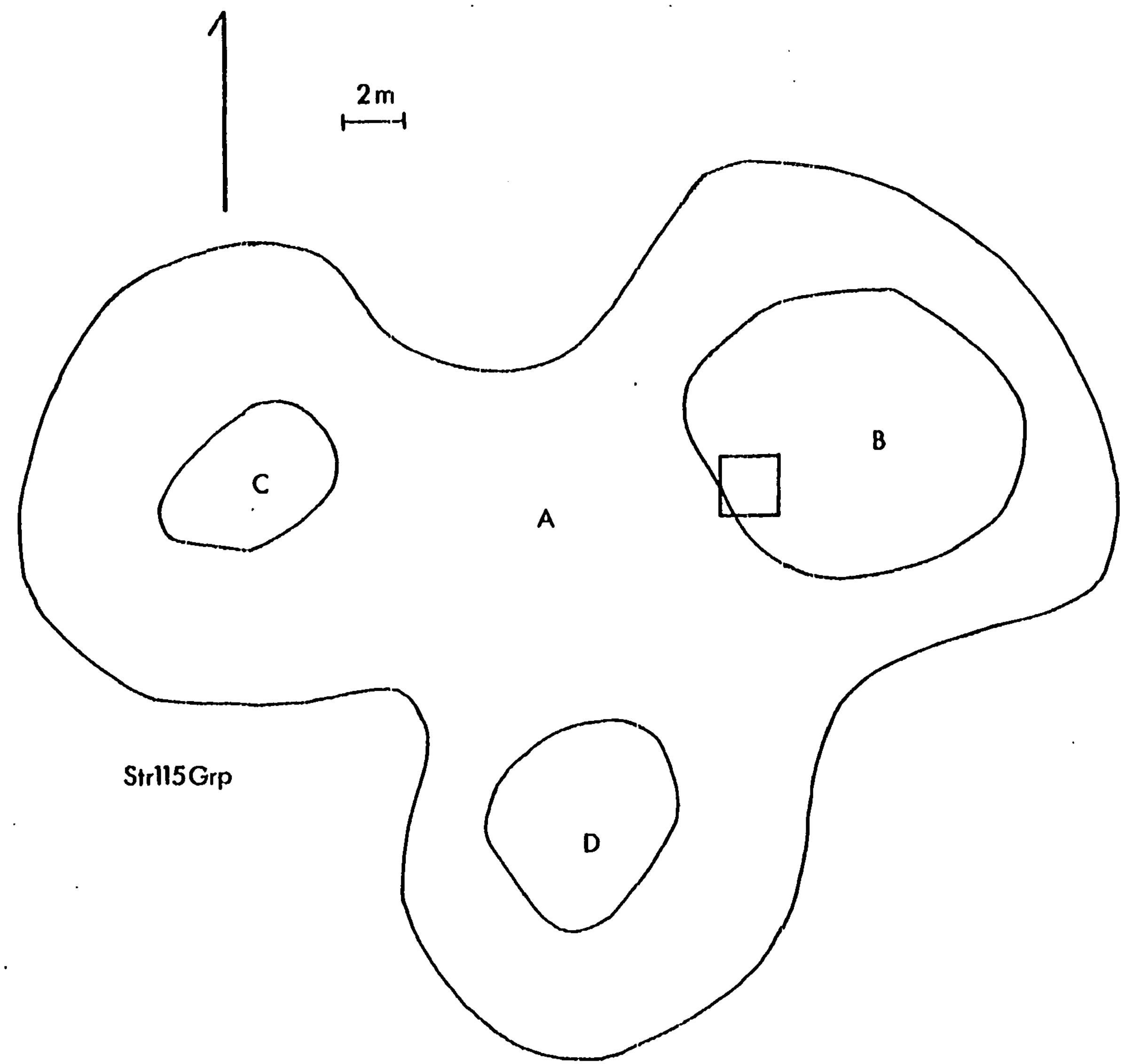

Fig. 36. Contour Map of the Structure 115 Group

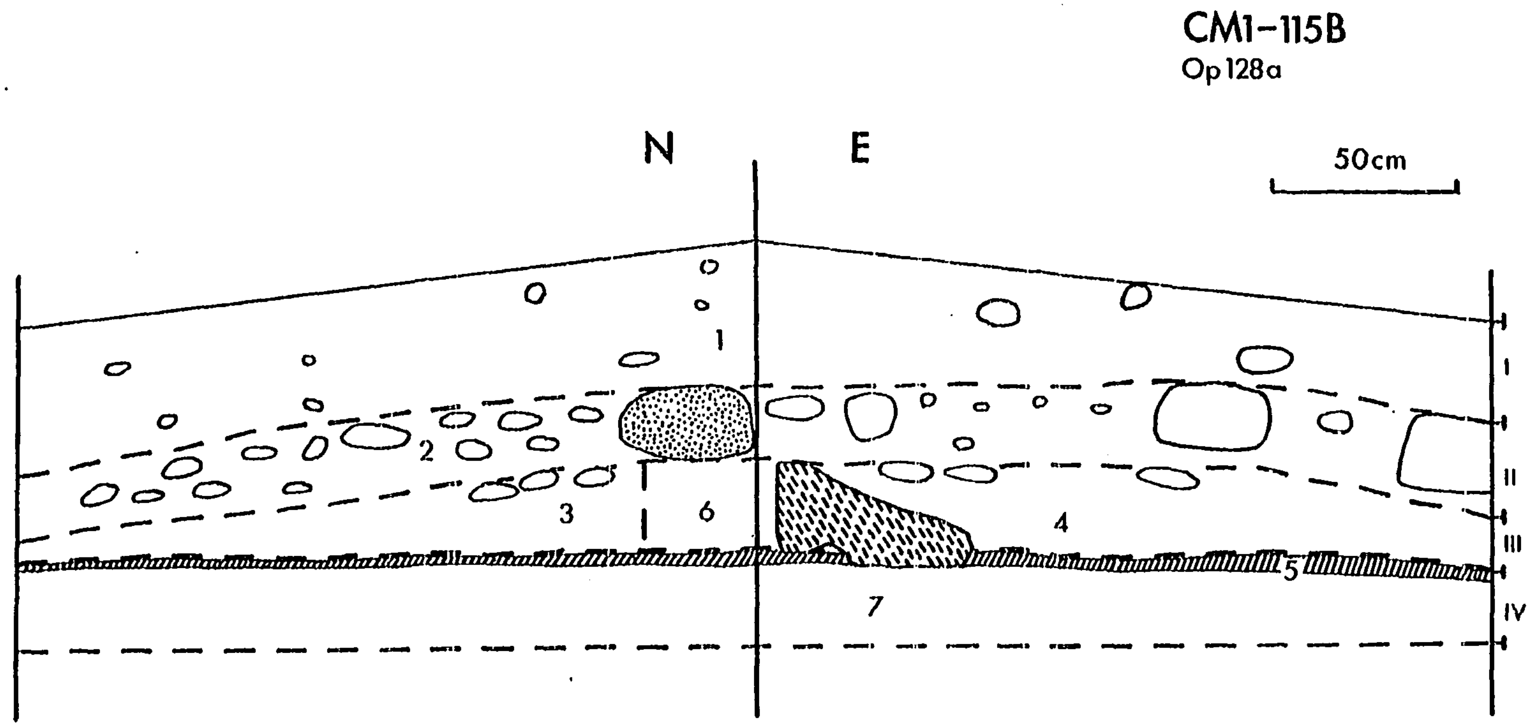

Fig. 37. Profile from Structure 115B (Operation 128)

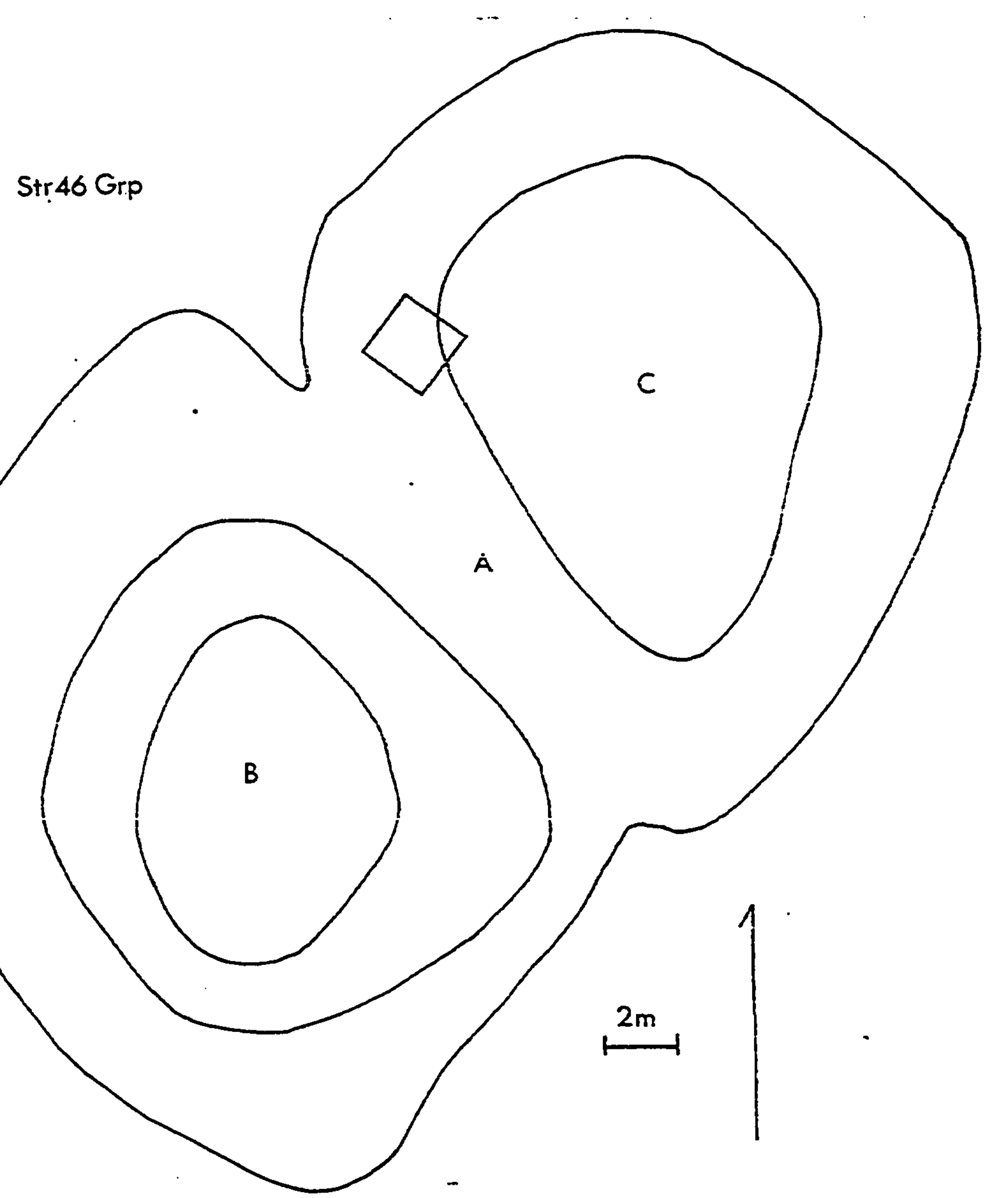

Fig. 38. Contour Map of the Structure 46 Group

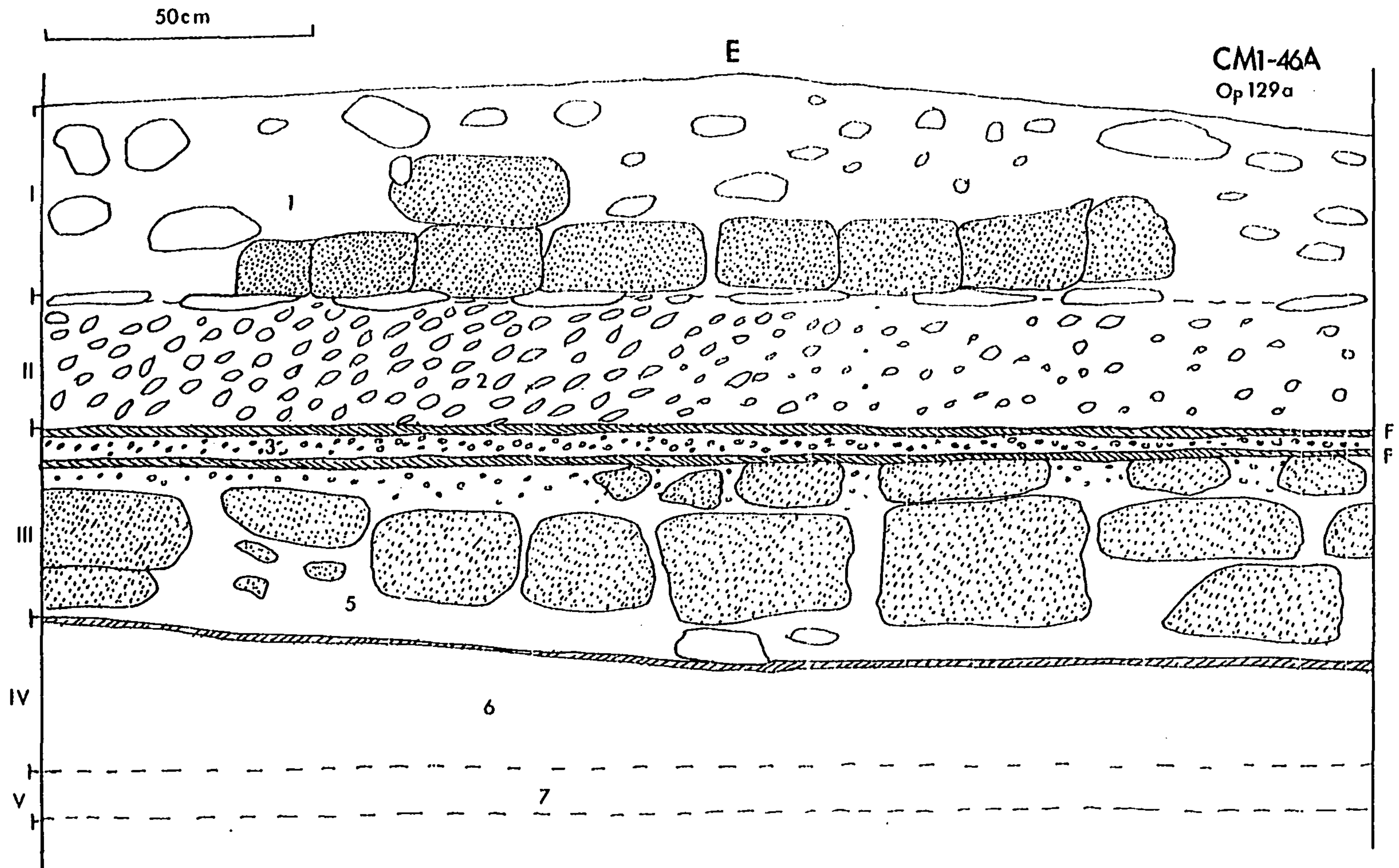

Fig. 39. Profile from Structure 46C (Operation 129)

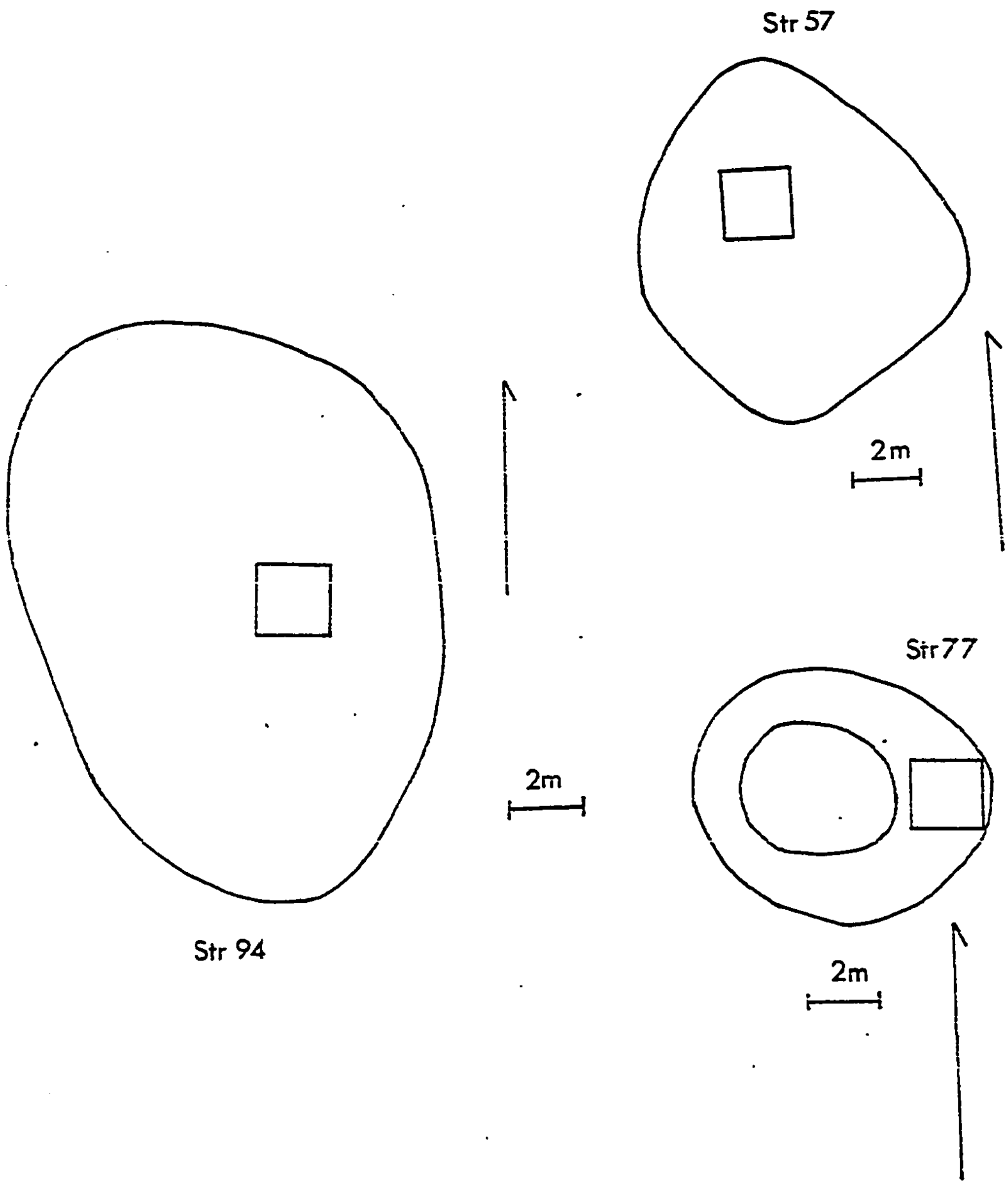

Fig. 40. Contour Map of Structures 94, 57, and 77

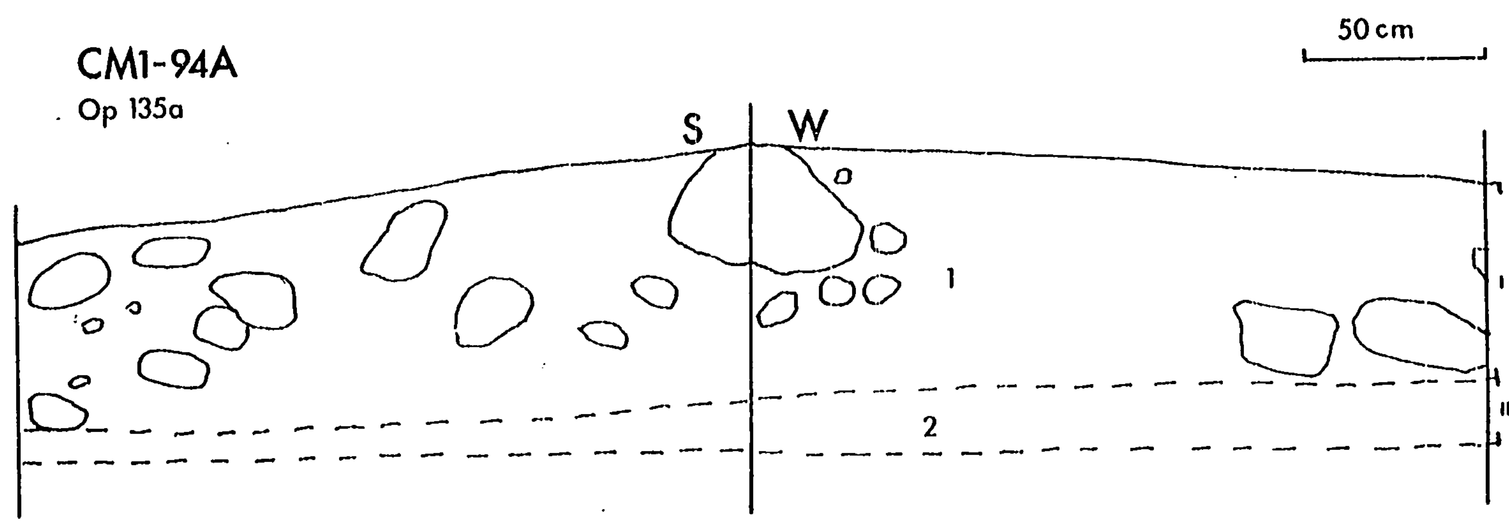

Fig. 41. Profile from Structure 94 (Operation 135)

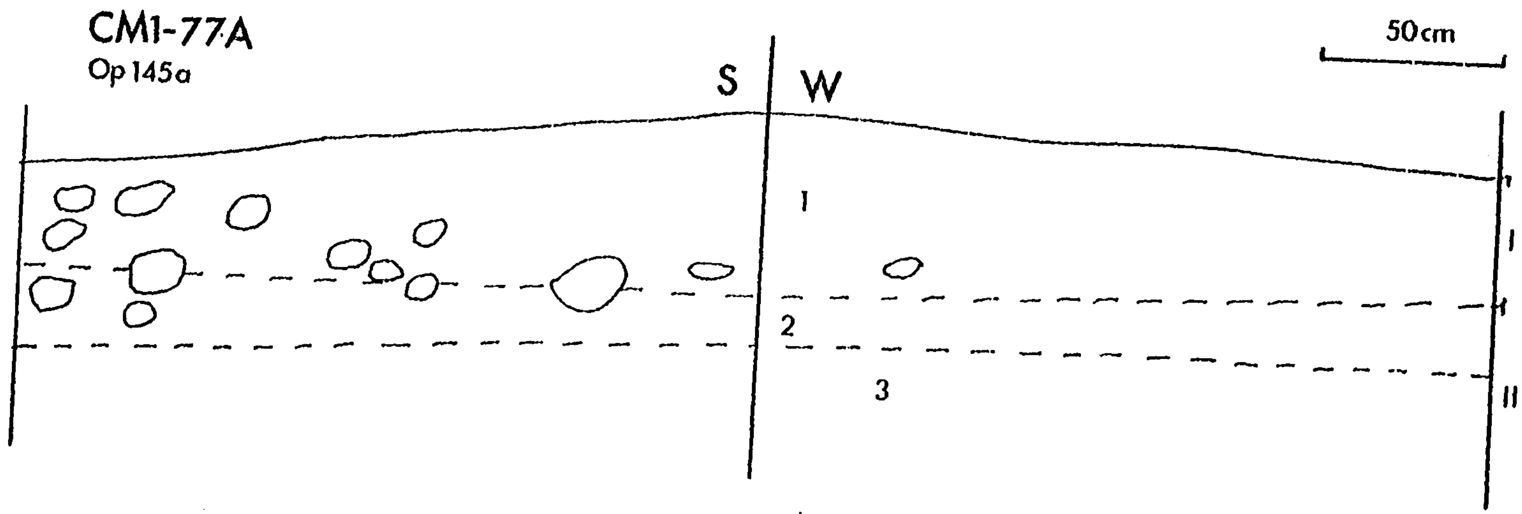

Fig. 42. Profile from Structure 77 (Operation 145)

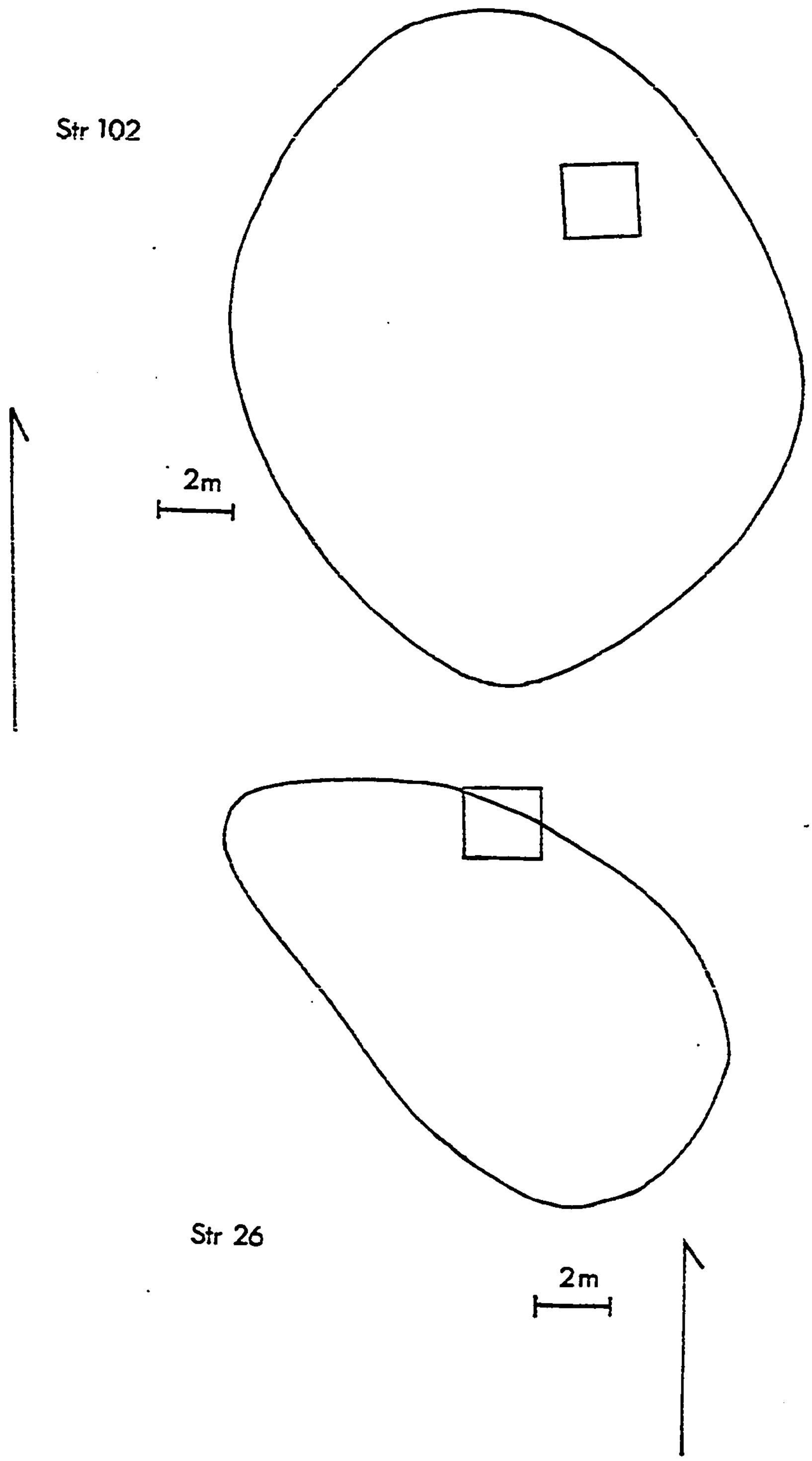

Fig. 43. Contour Map of Structures 102 and 26

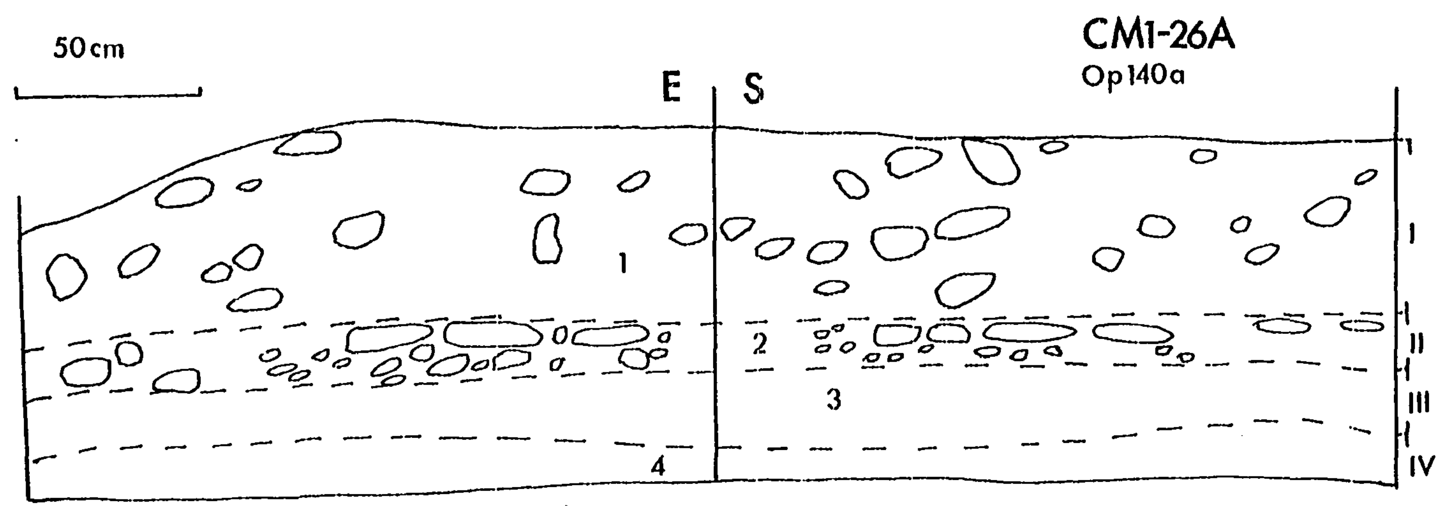

Fig. 44. Profile from Structure 26 (Operation 140)

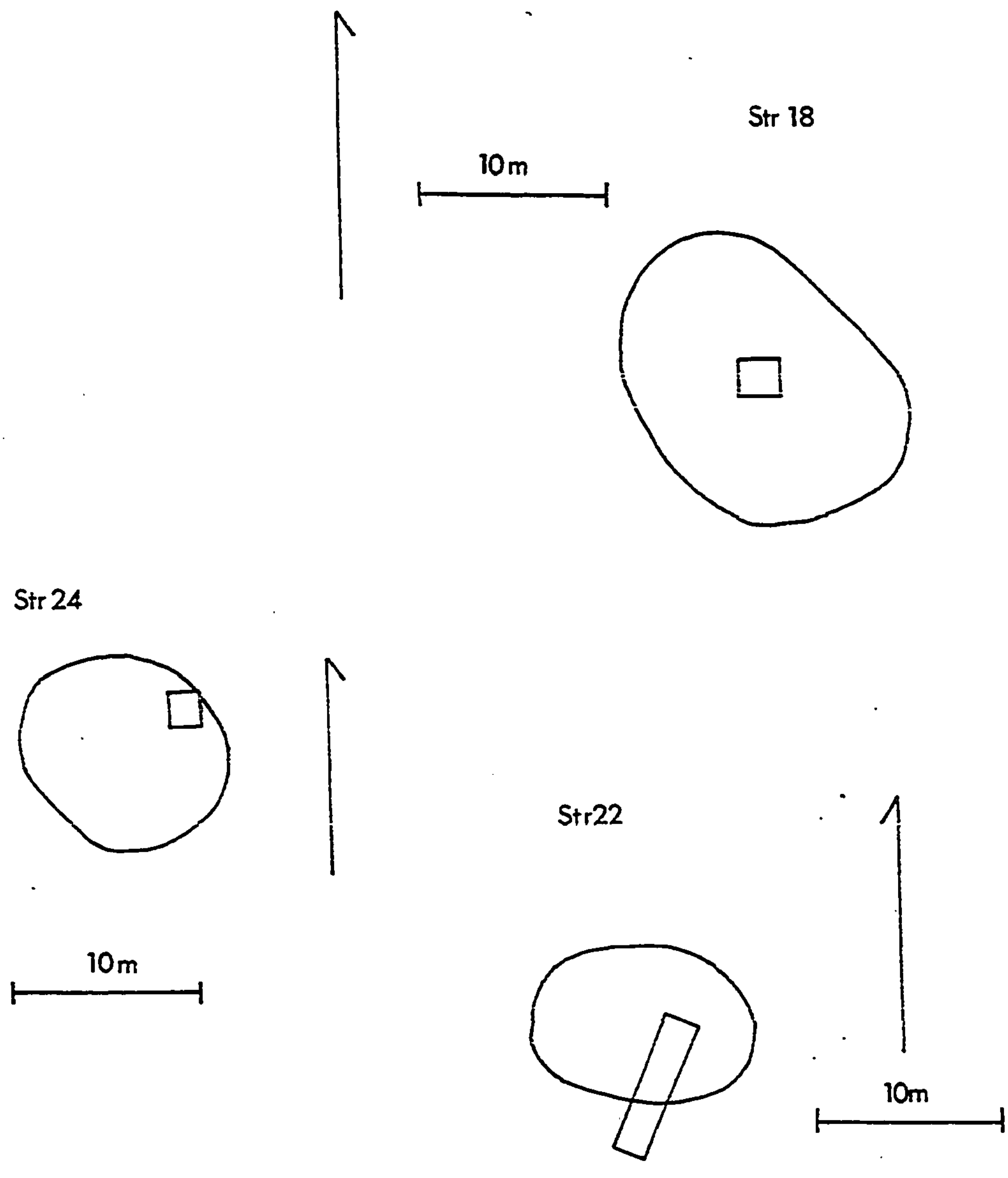

Fig. 45. Contour Map of Structures 24, 18, and 22

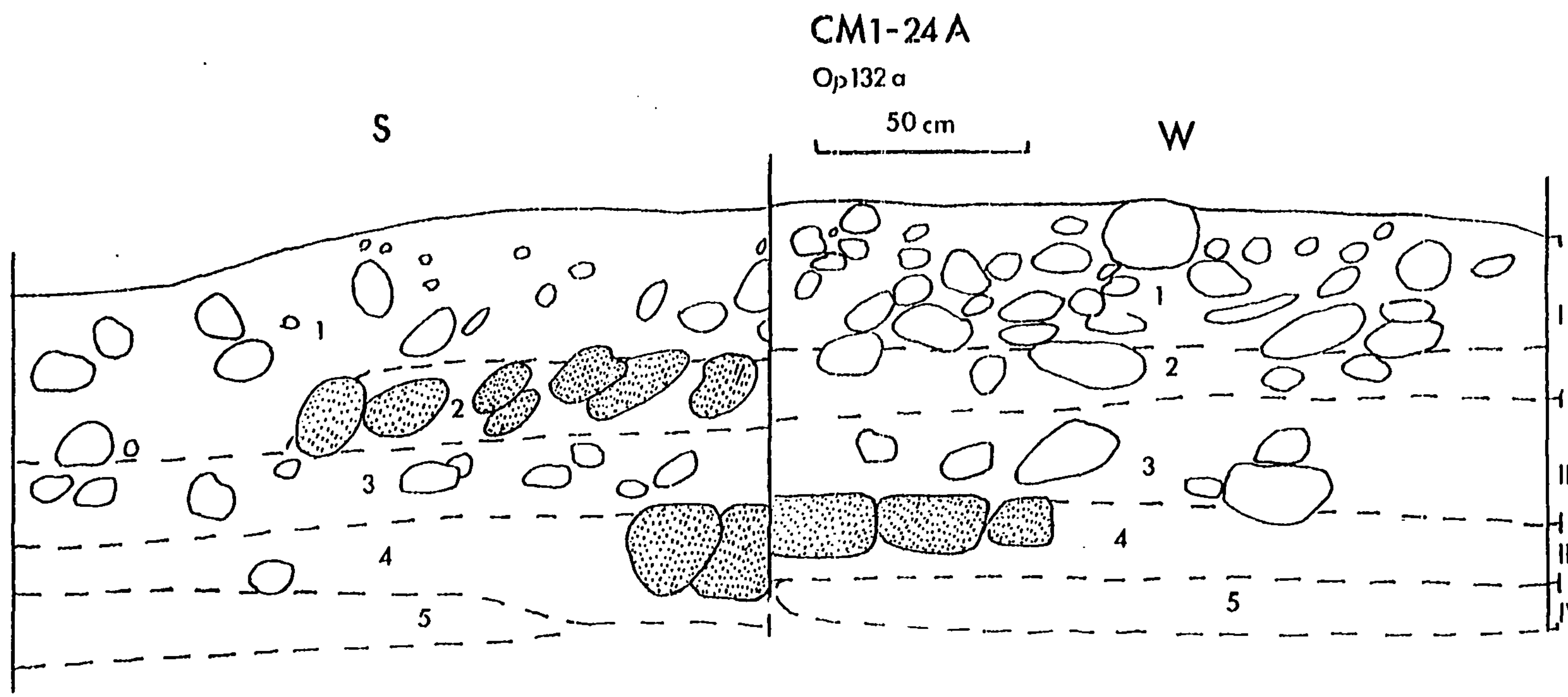

Fig. 46. Profile from Structure 24 (Operation 132)

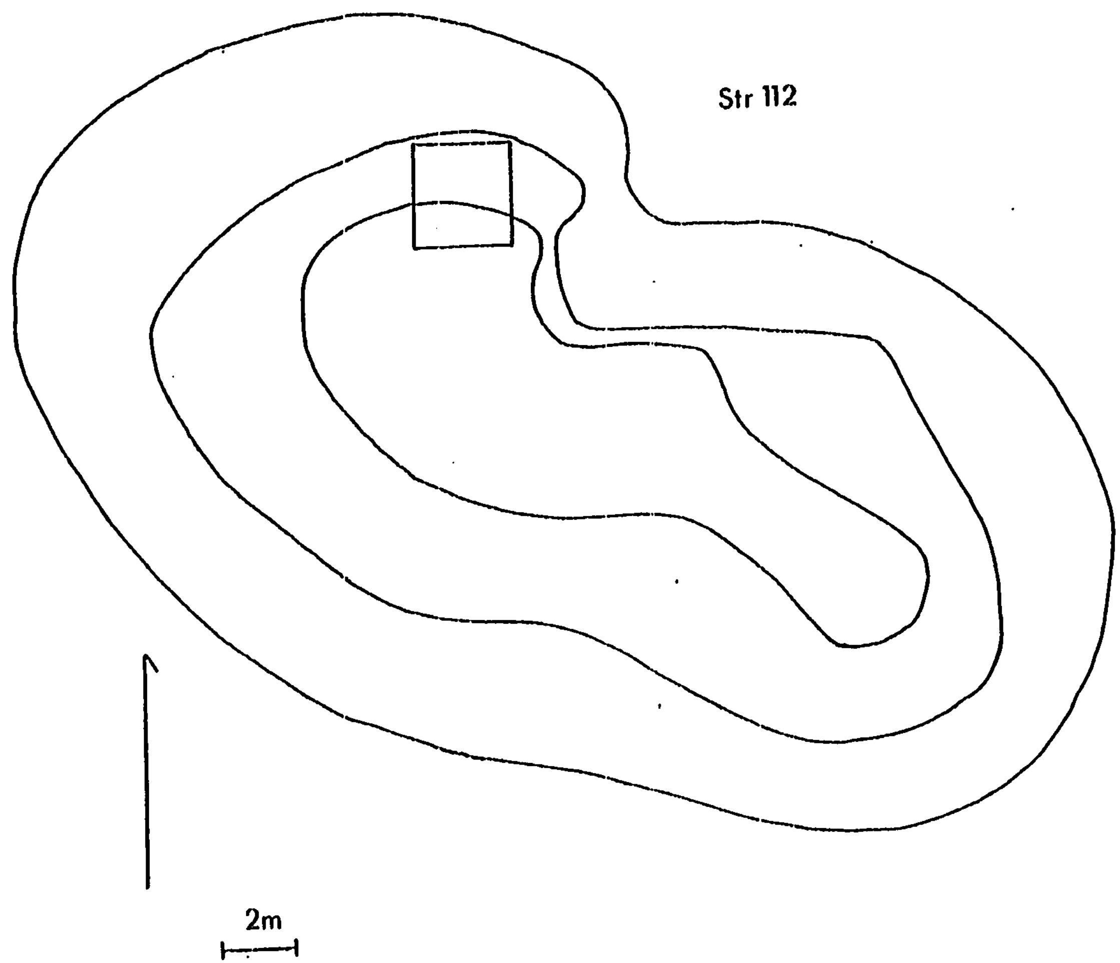

Fig. 47. Contour Map of Structure 112

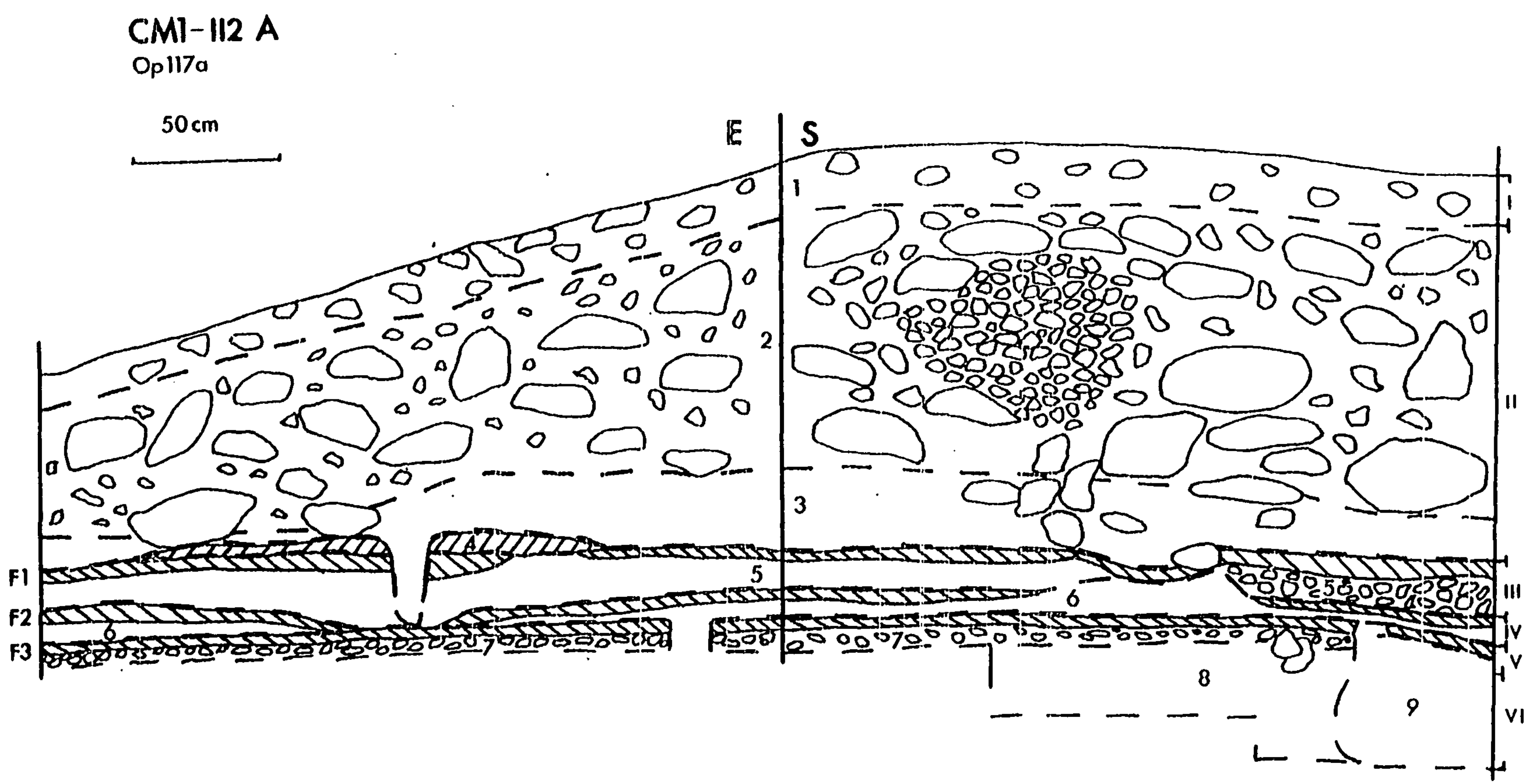

Fig. 48. Profile from Structure 112 (Operation 117)

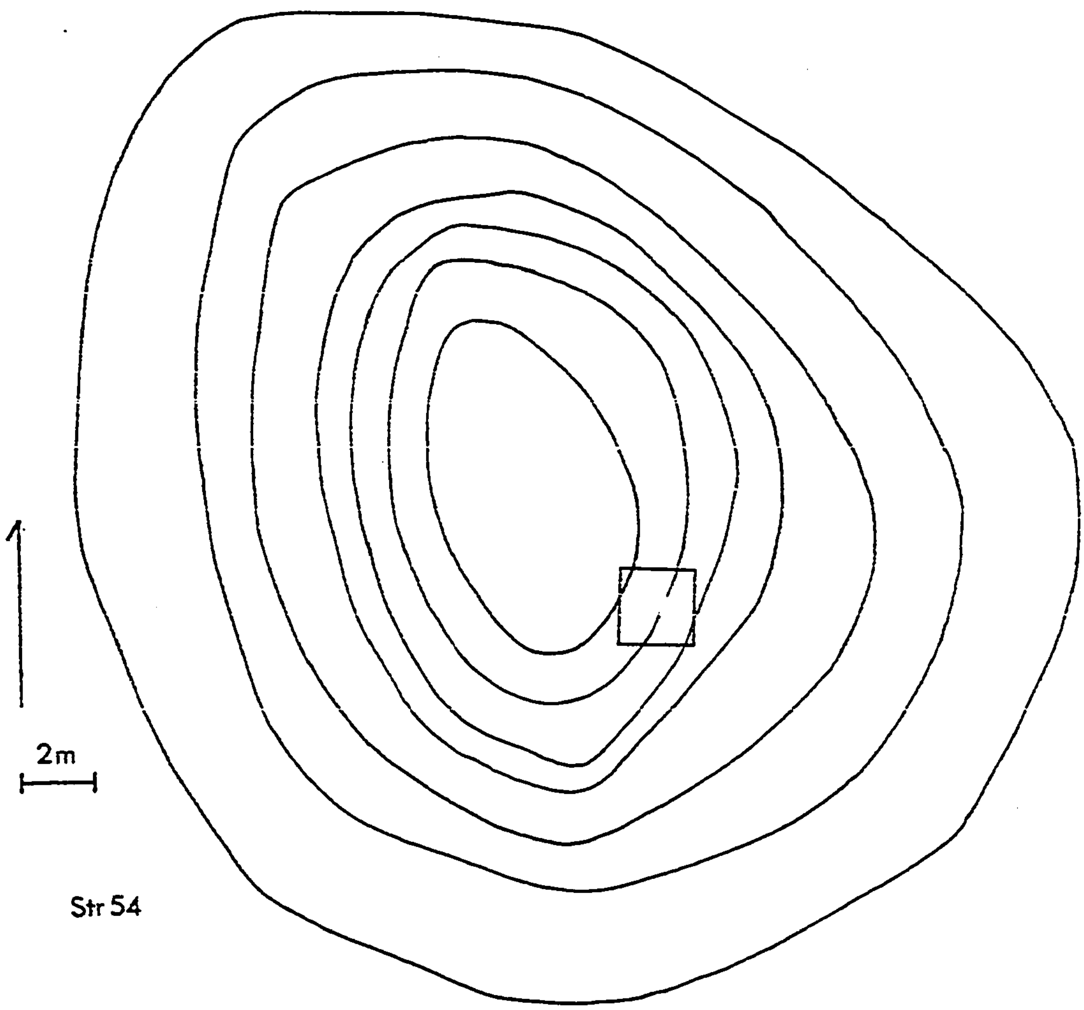

Fig. 49. Contour Map of Structure 54

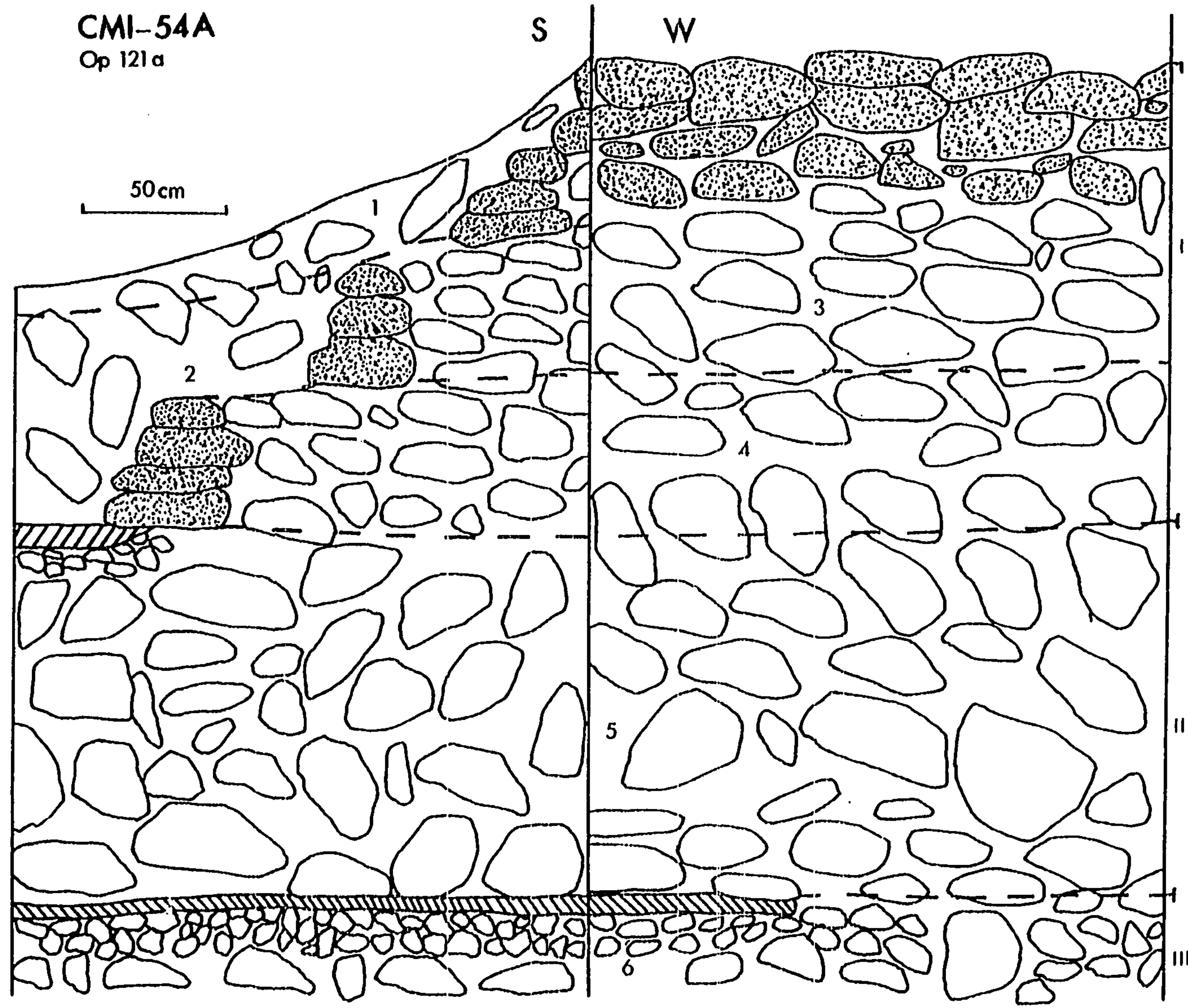

Fig. 50. Profile from Structure 54 (Operation 121)

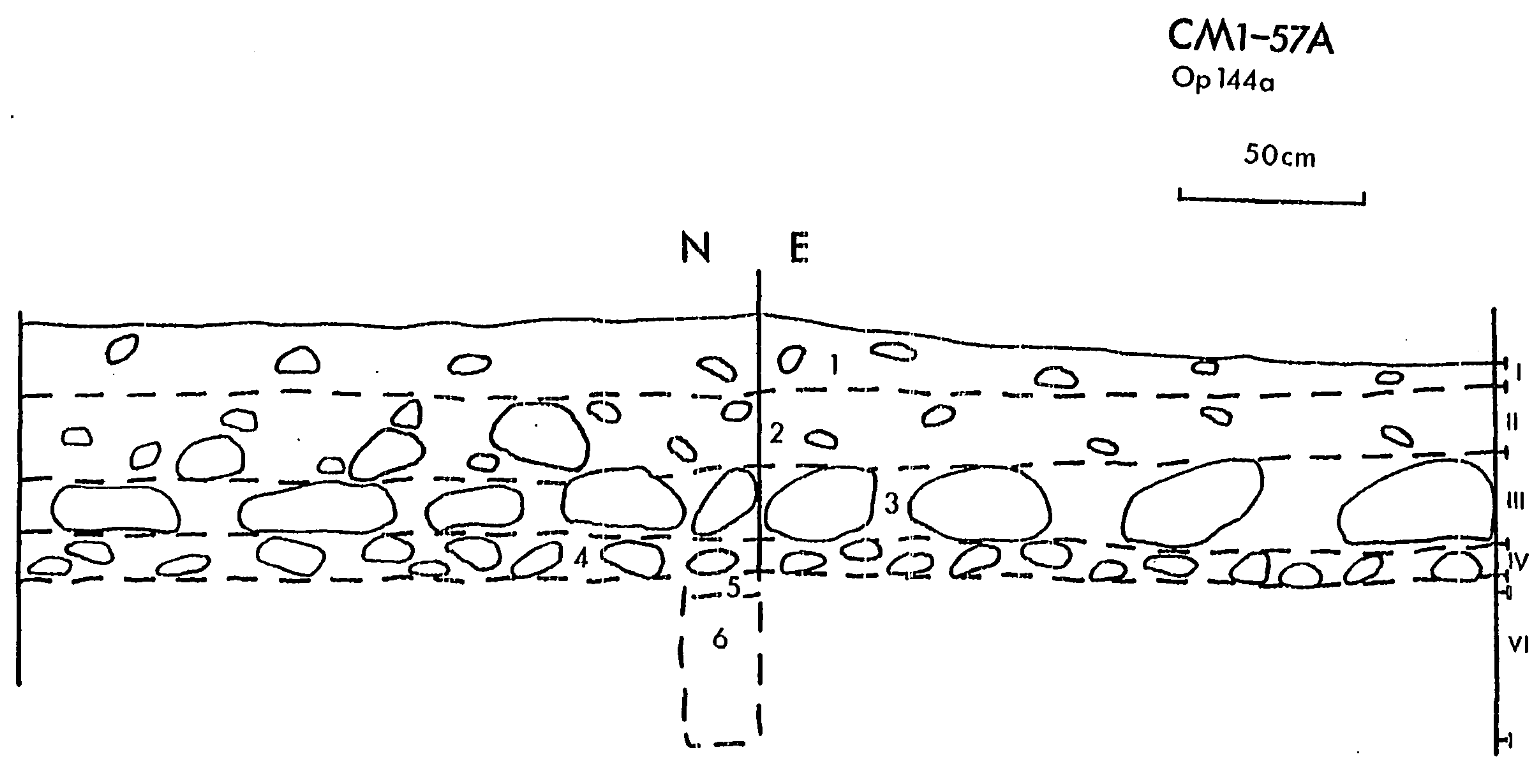

Fig. 51. Profile from Structure 57 (Operation 144)

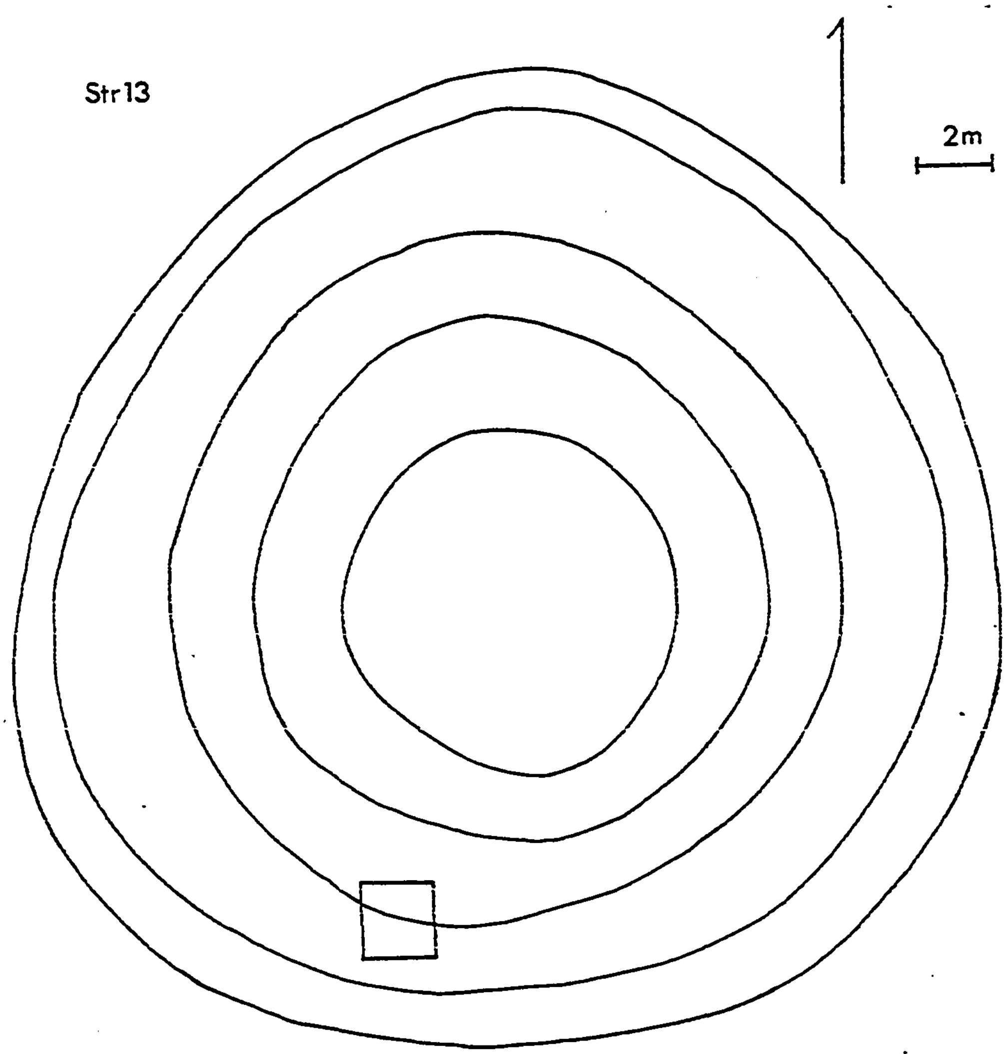

Fig. 52. Contour Map of Structure 13

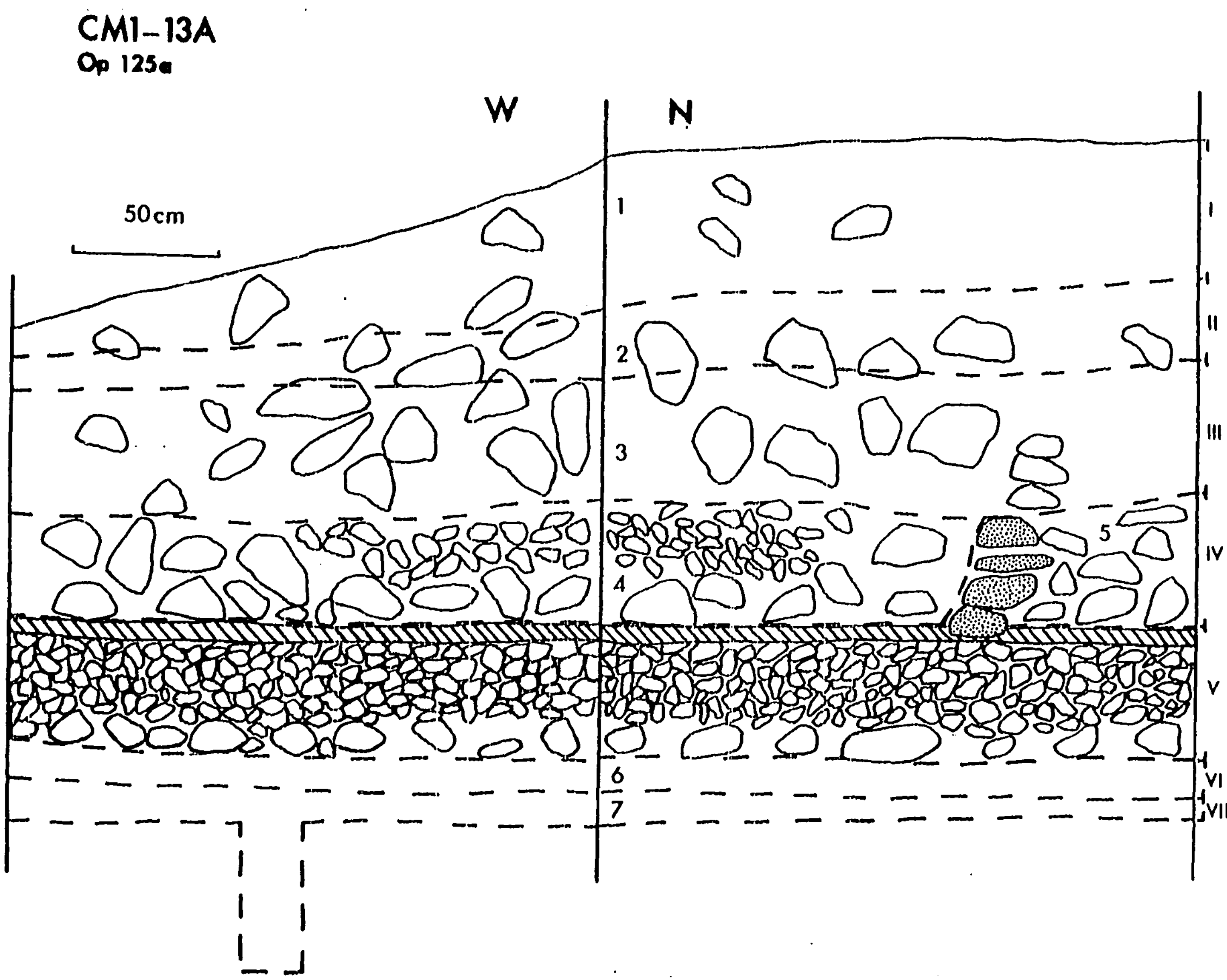

Fig. 53. Profile from Structure 13 (Operation 125)

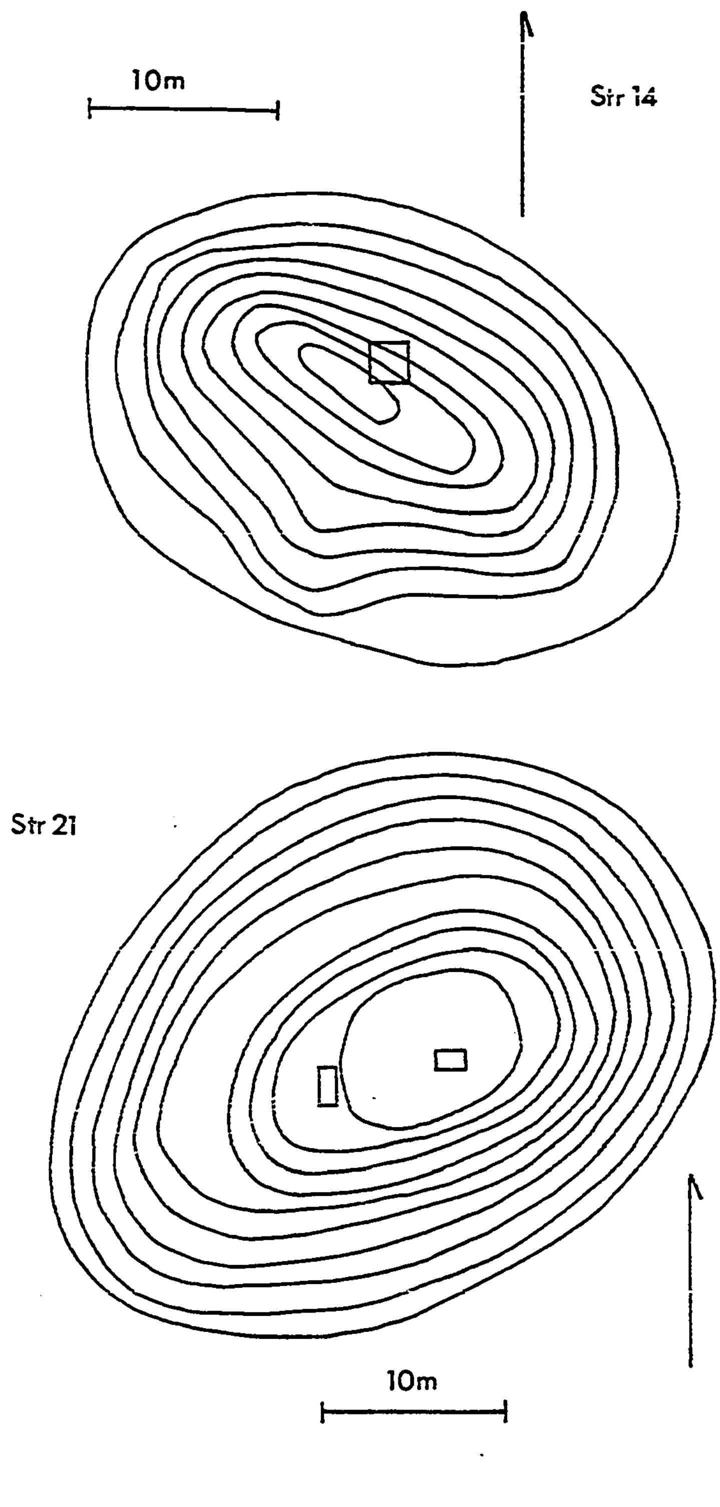

Fig. 54. Contour Map of Structures 14 and 21

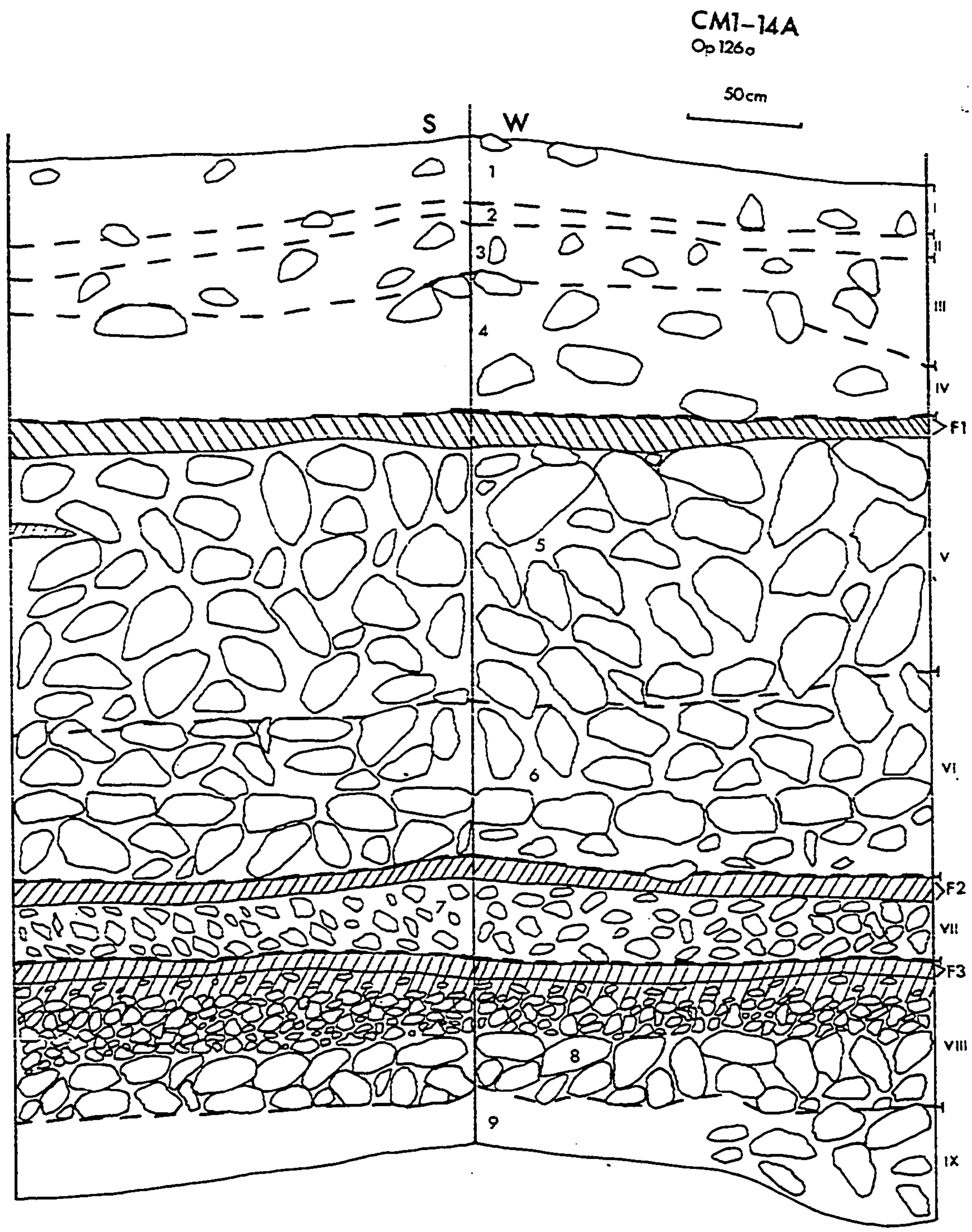

Fig. 55. Profile from Structure 14 (Operation 126)

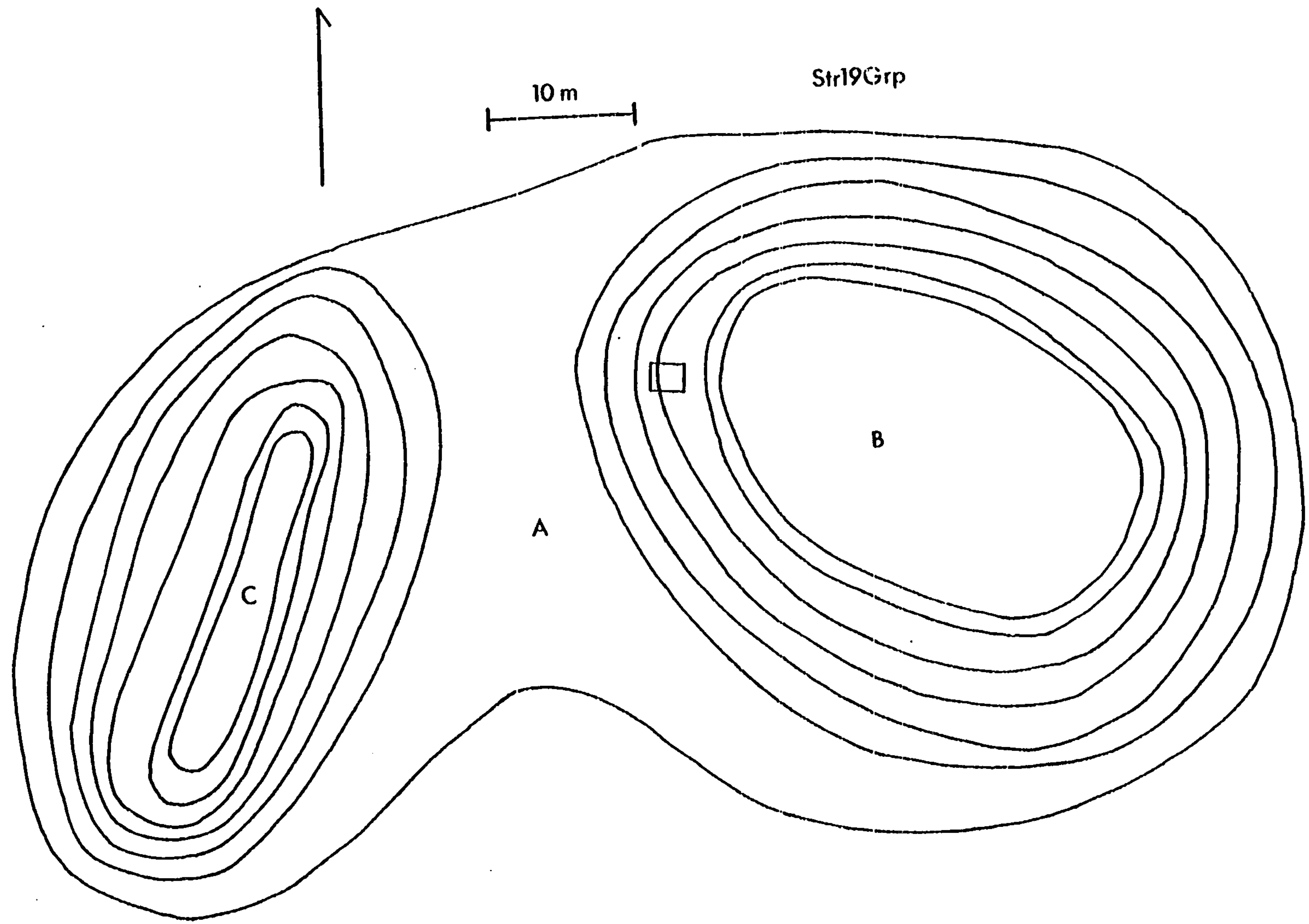

Fig. 56. Contour Map of the Structure 19 Group

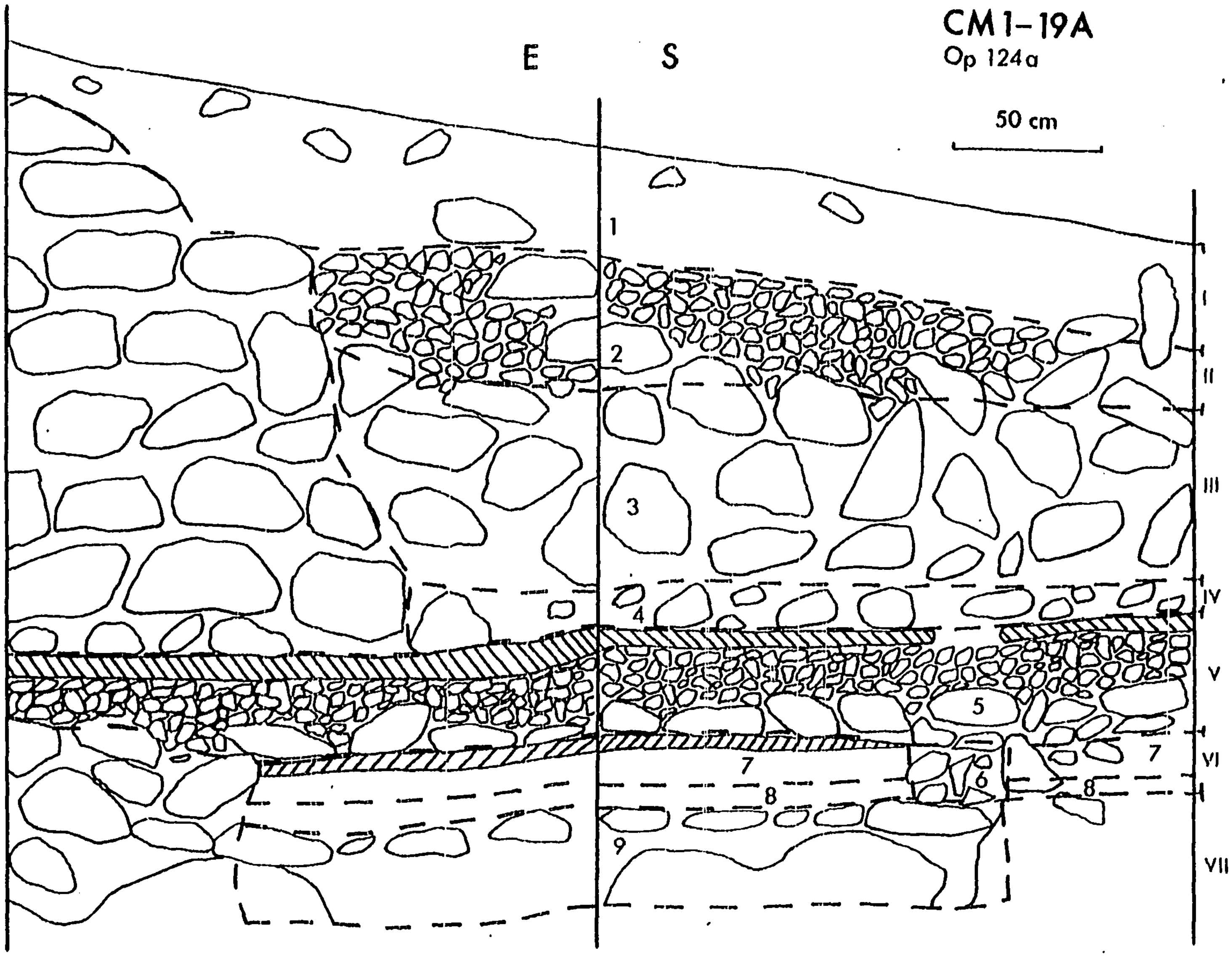

Fig. 57. Profile from Structure 19A (Operation 124)

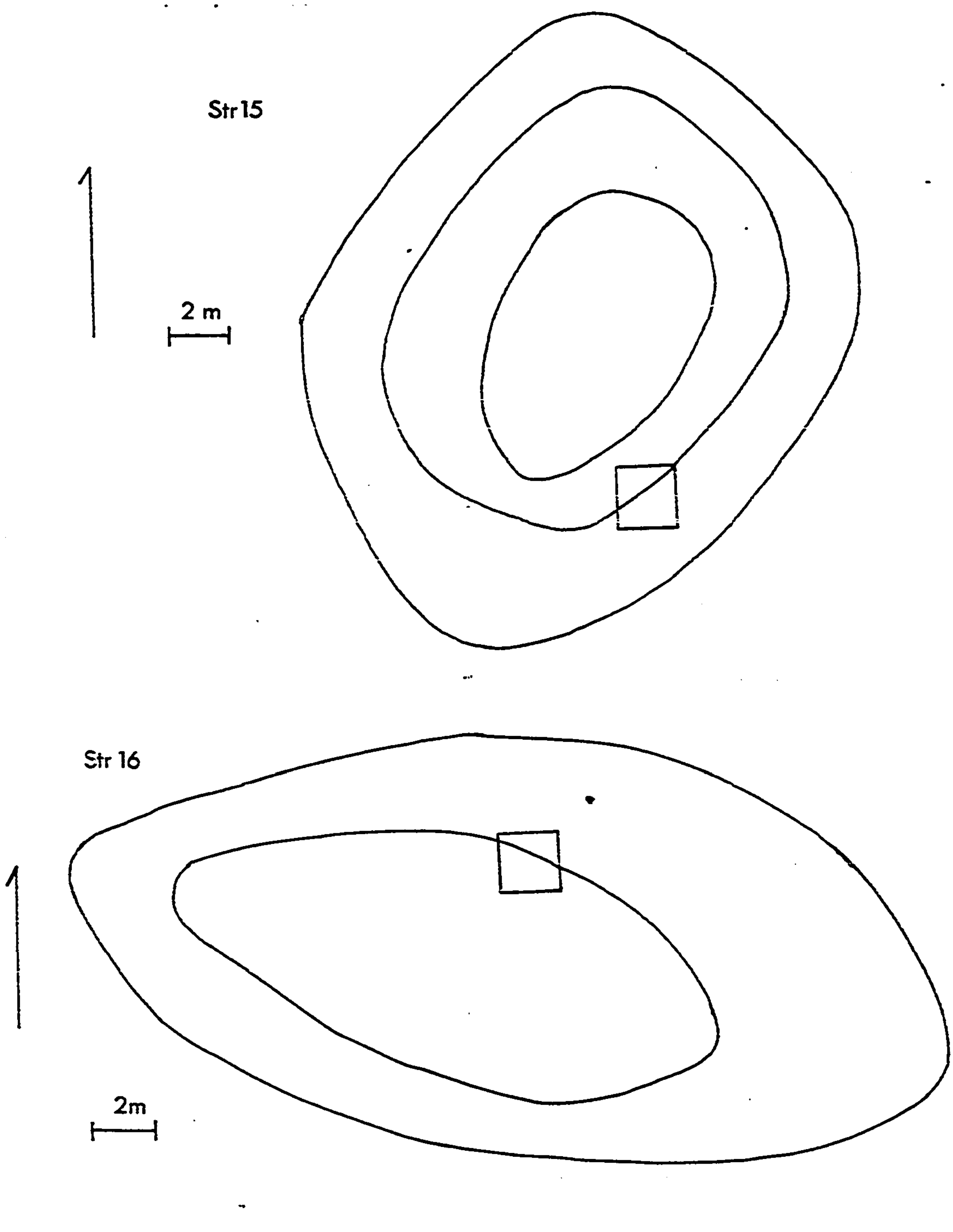

Fig. 58. Contour Map of Structures 15 and 16

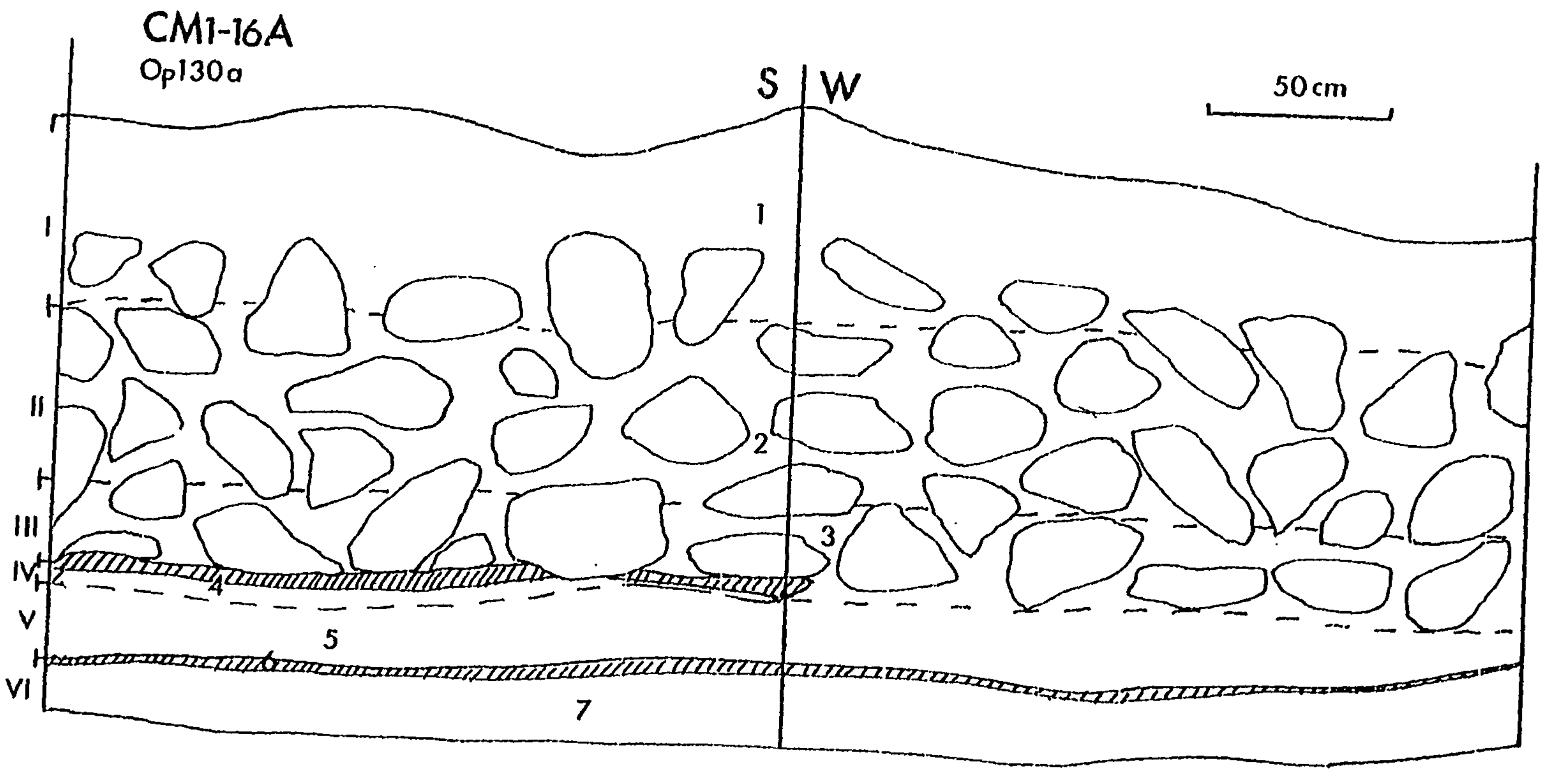

Fig. 59. Profile from Structure 16 (Operation 130)

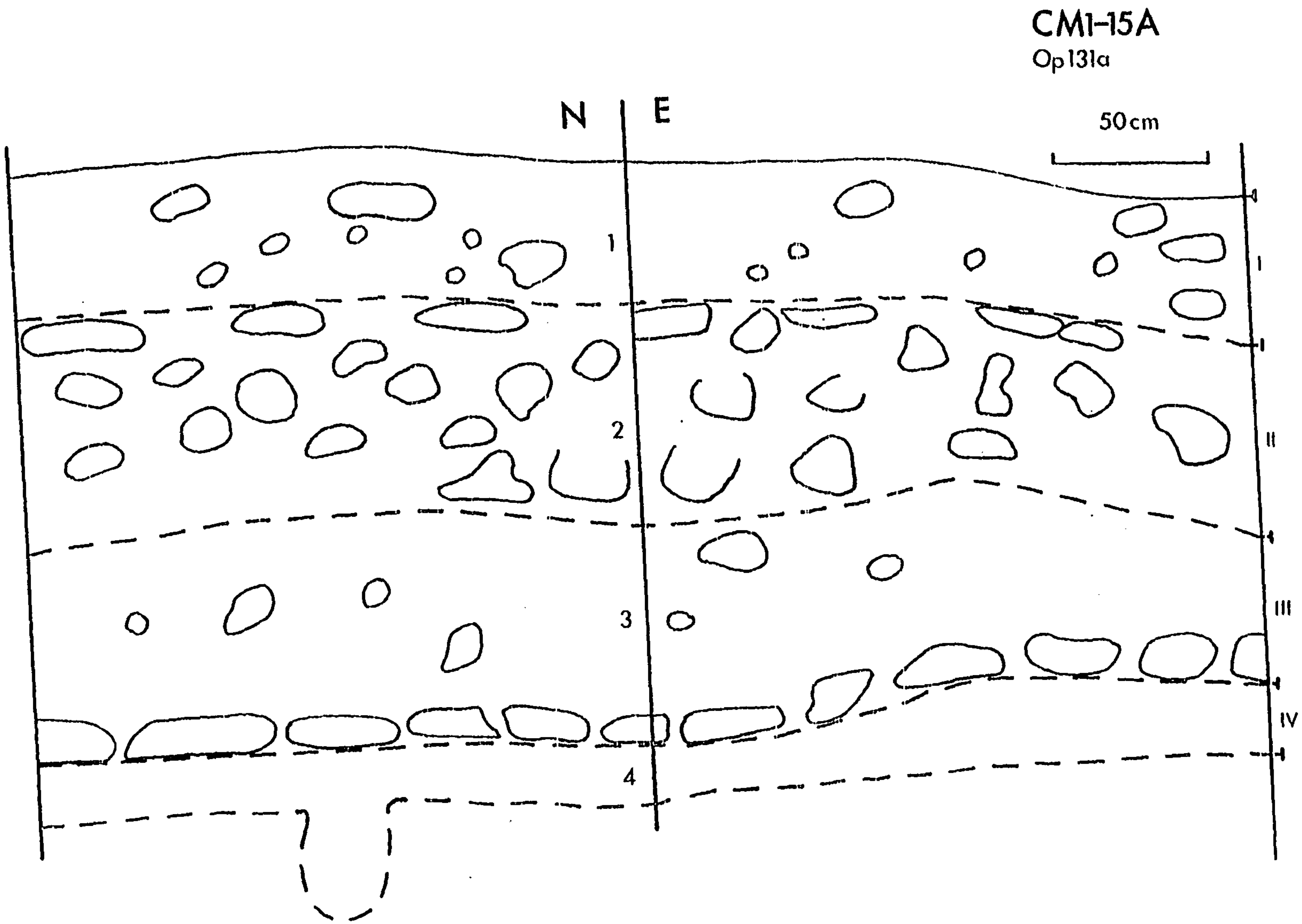

Fig. 60. Profile from Structure 15 (Operation 131)

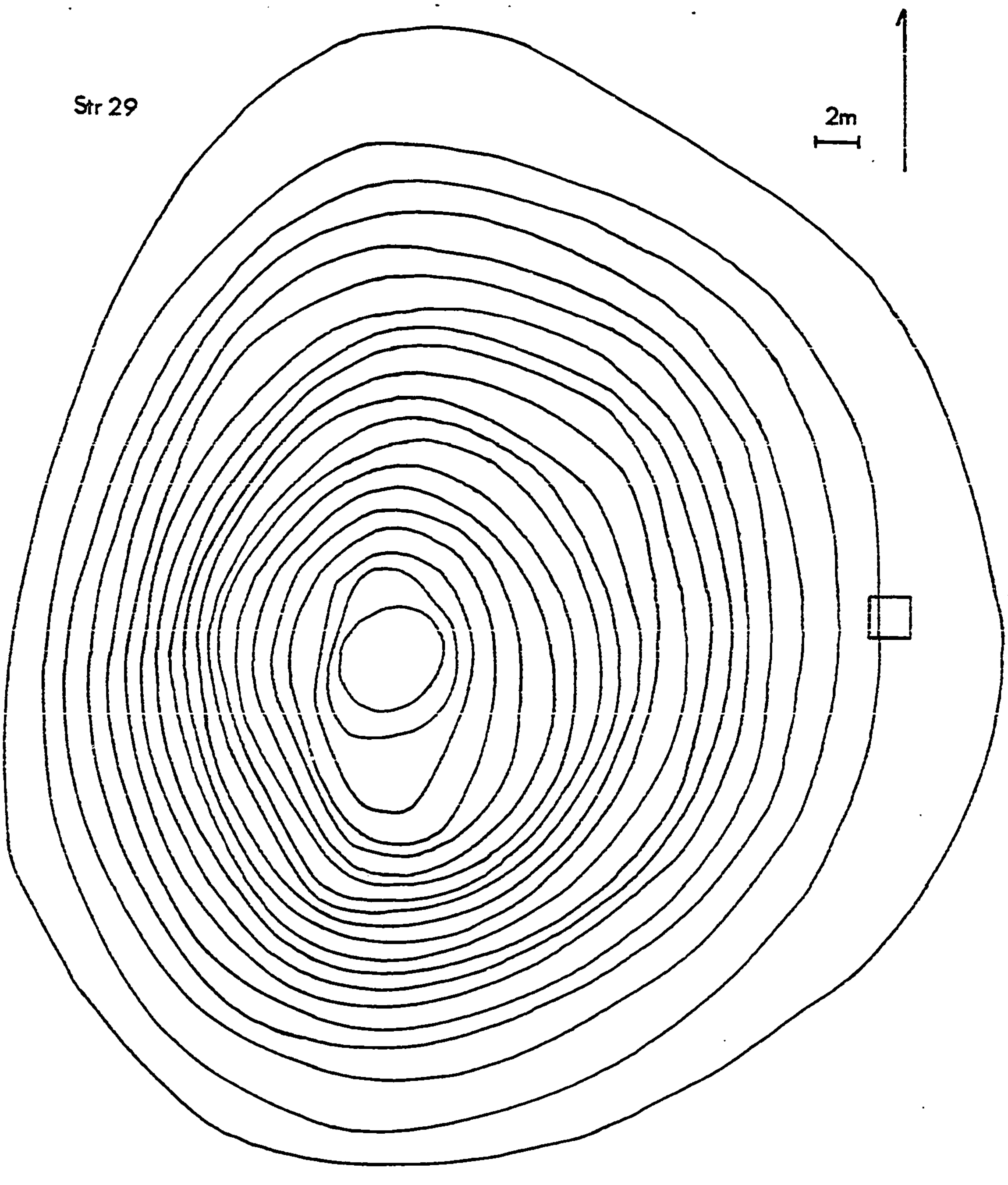

Fig. 61. Contour Map of Structure 29

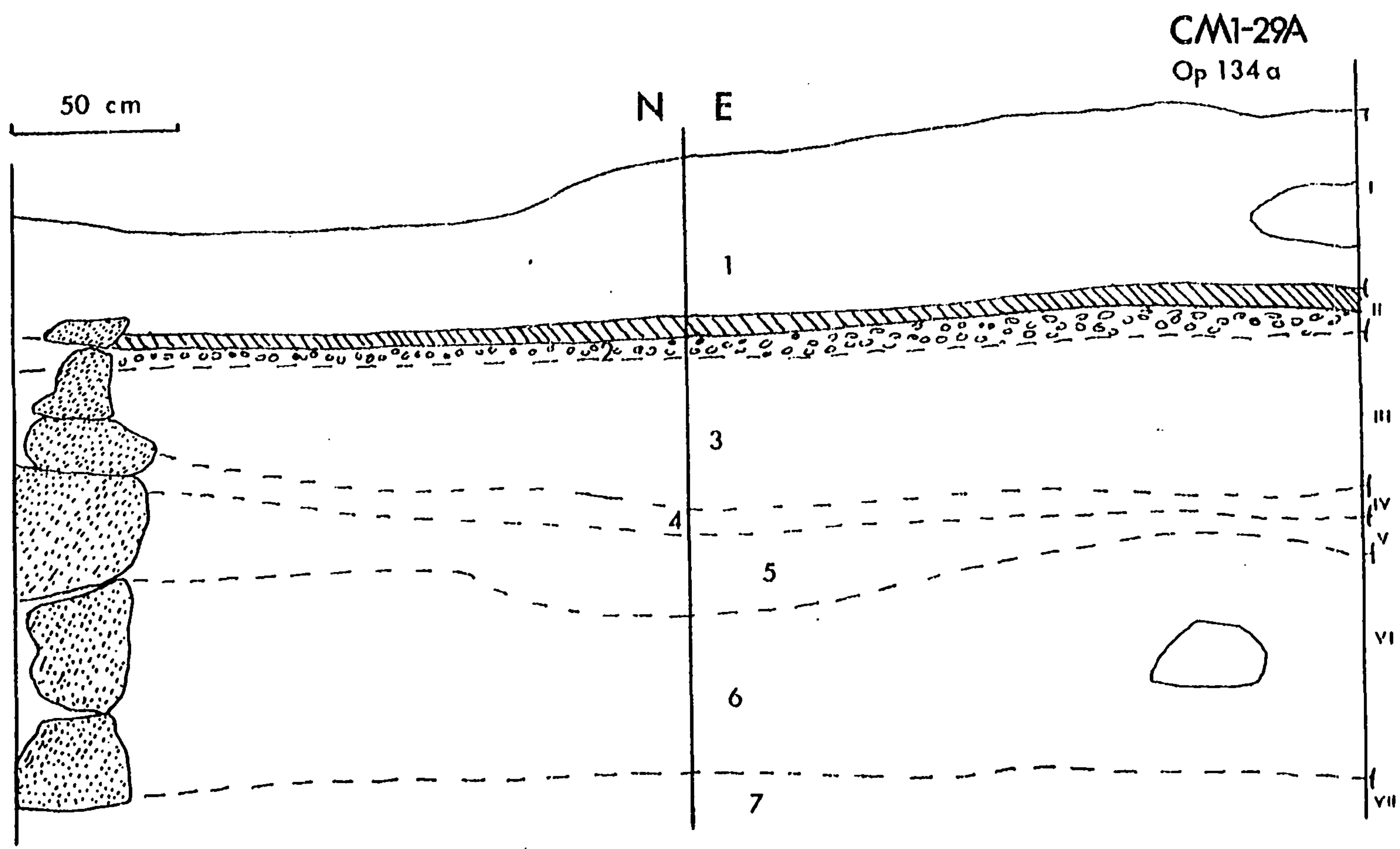

Fig. 62. Profile from Structure 29A (Operation 134)

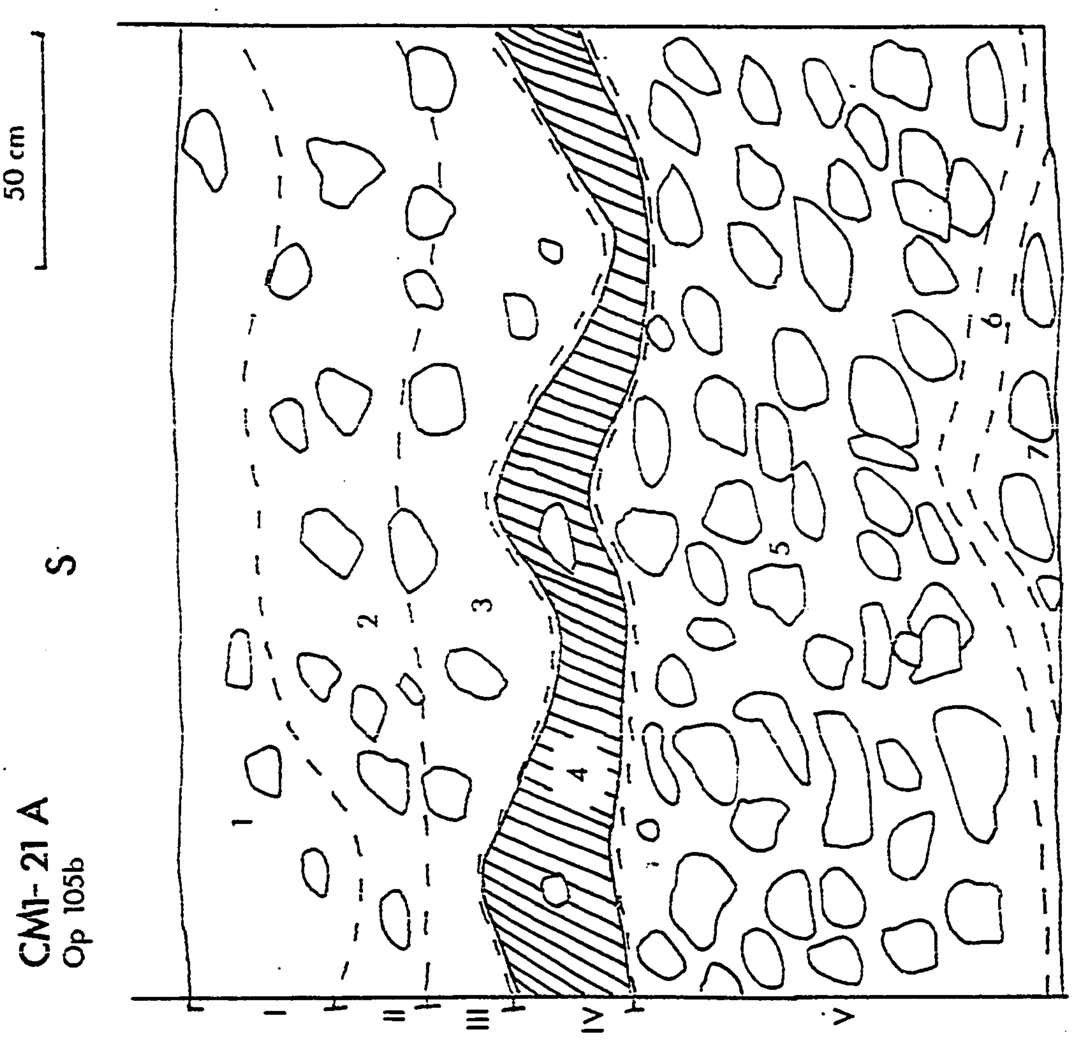

Fig. 63. Profile from Structure 21 (Operation 105)

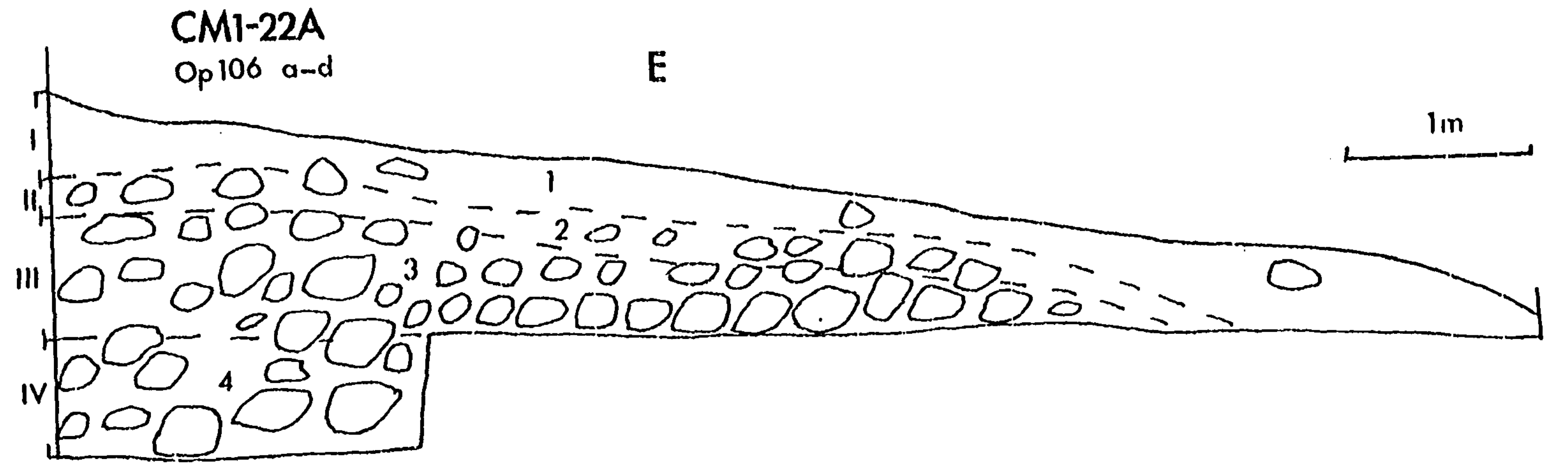

Fig. 64. Profile from Structure 22 (Operation 106)

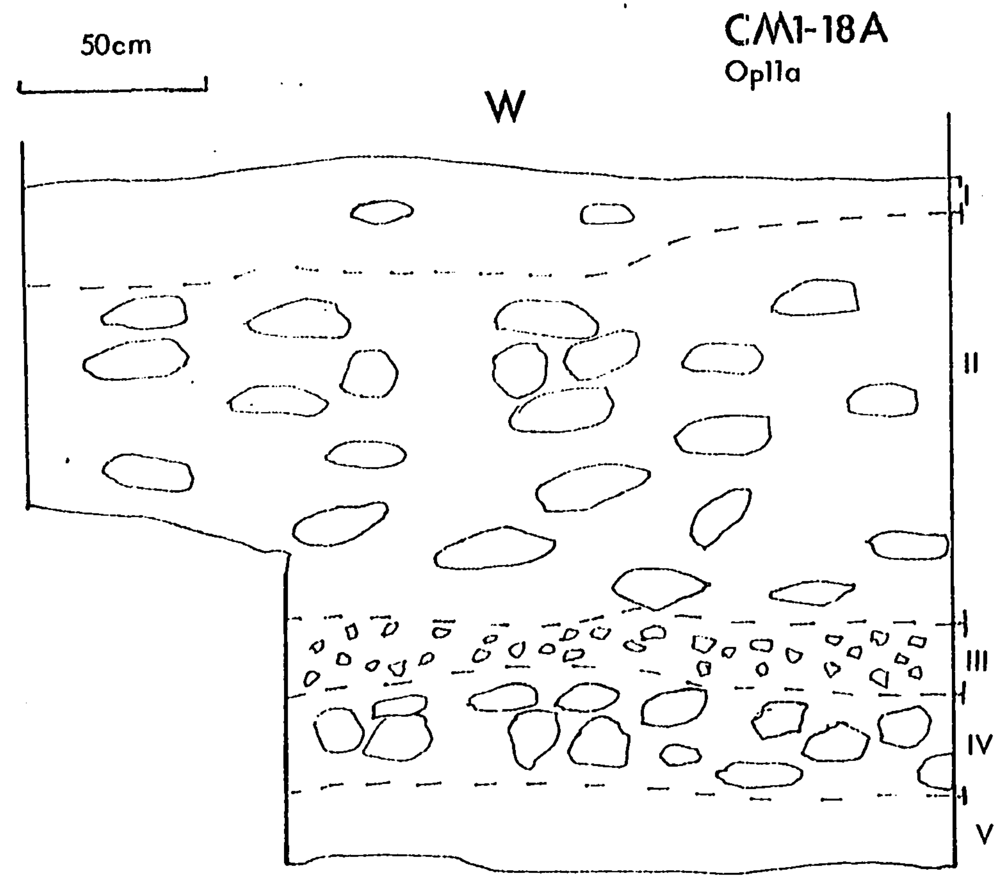

Fig. 65. Profile from Structure 18 (Operation 11)

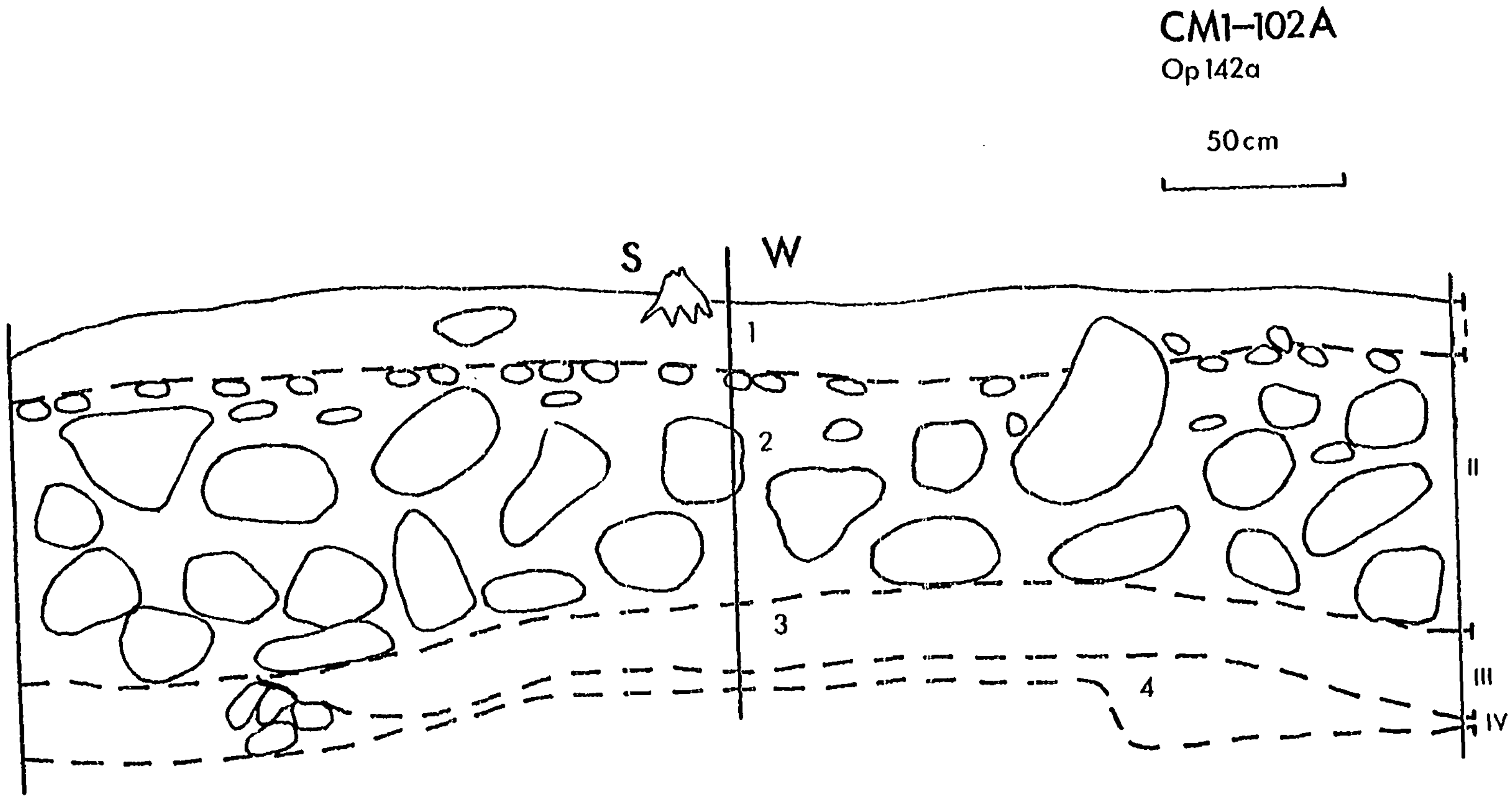

Fig. 66. Profile from Structure 102 (Operation 142)

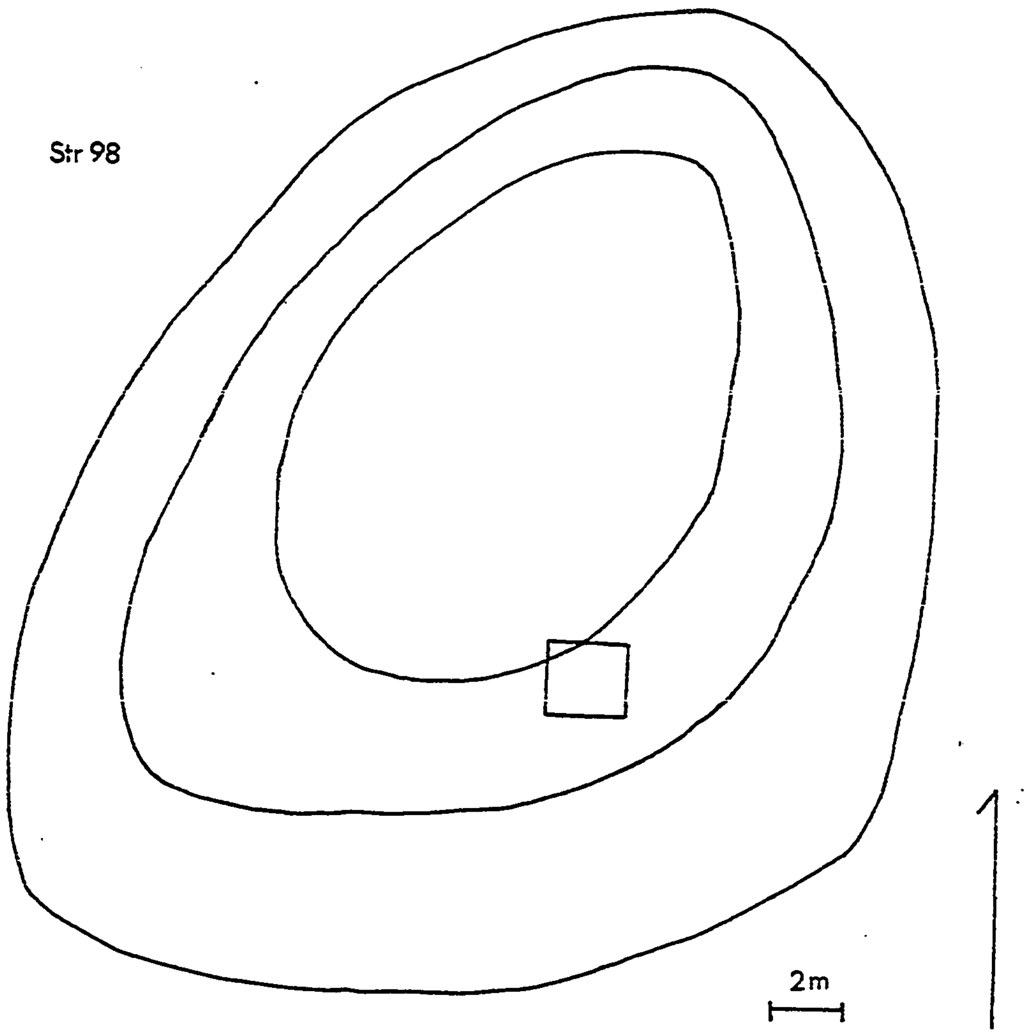

Fig. 67. Contour Map of Structure 98

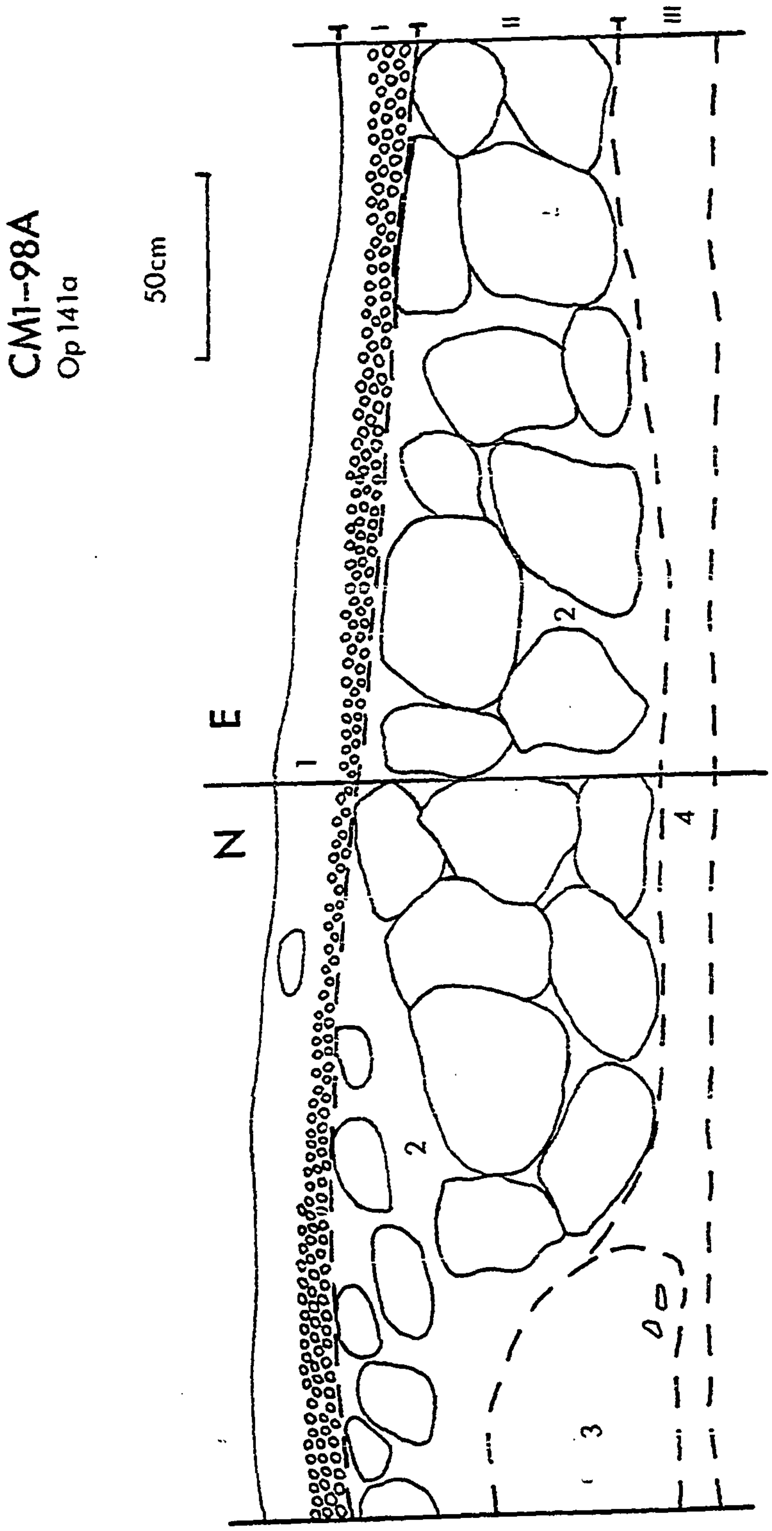

Fig. 68. Profile from Structure 98 (Operation 141)

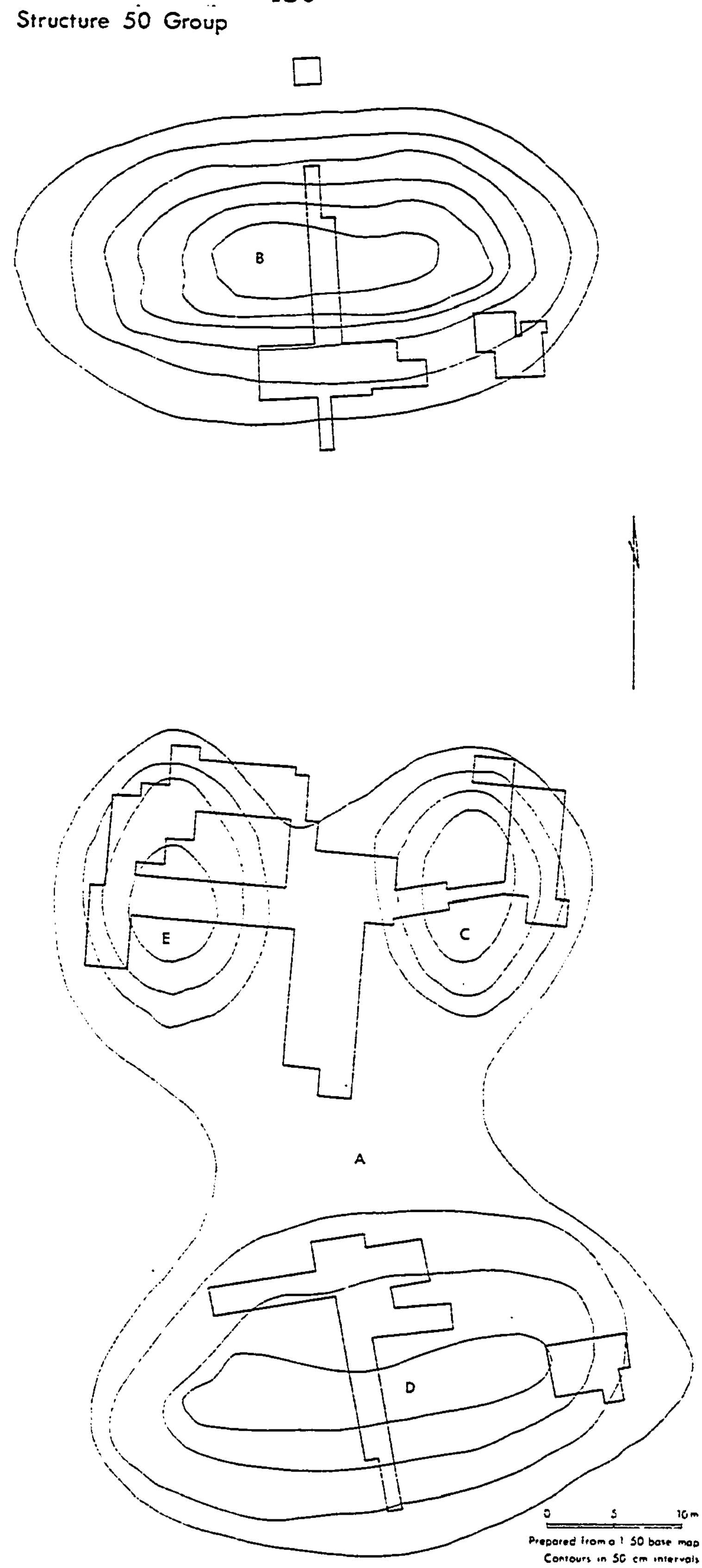

Fig. 69. Contour Map of the Structure 50 Group

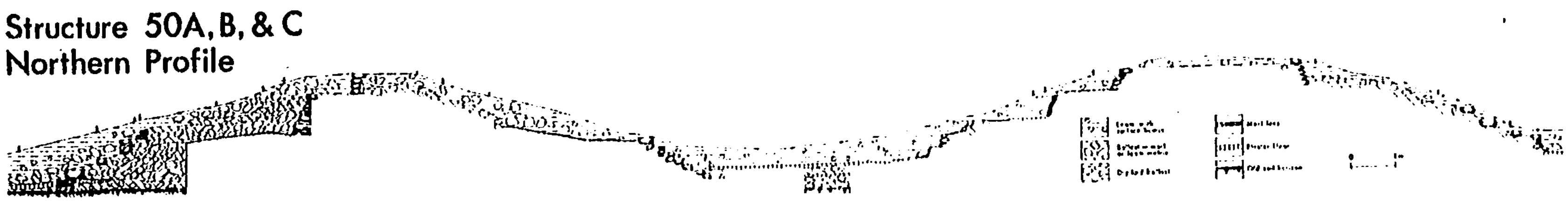

Fig. 70. Profile from Structures 50A, E, and C

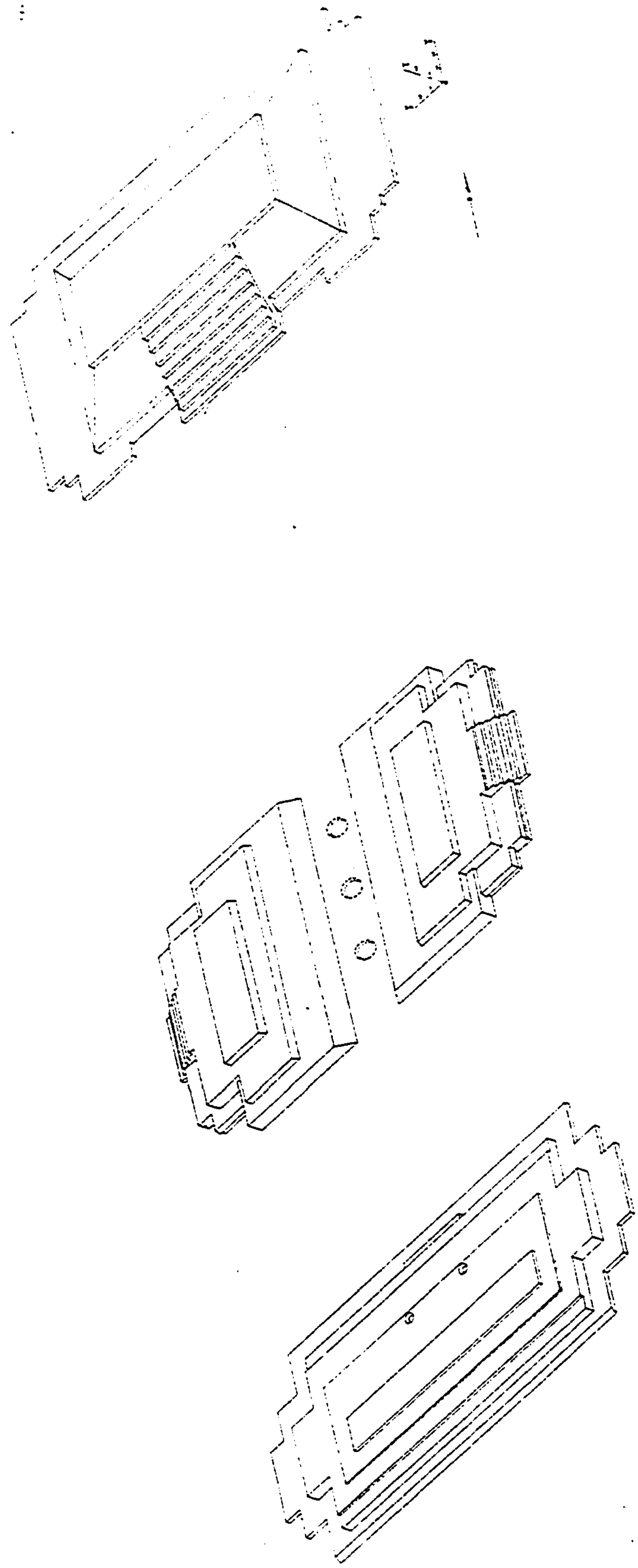

Fig. 71. Isometric Plan of the Structure 50 Group

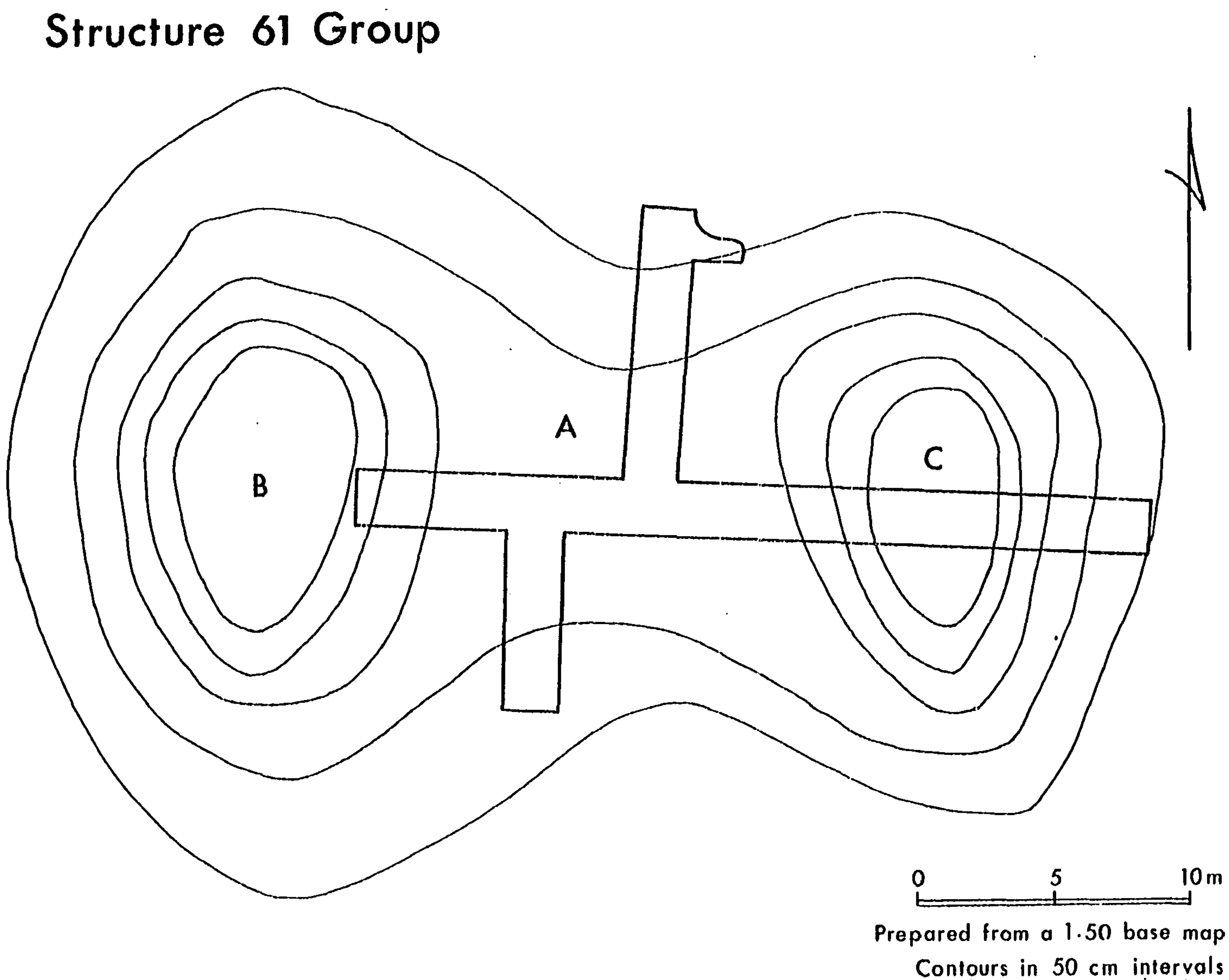

Fig. 72. Contour Map of..the Structure 61 Group

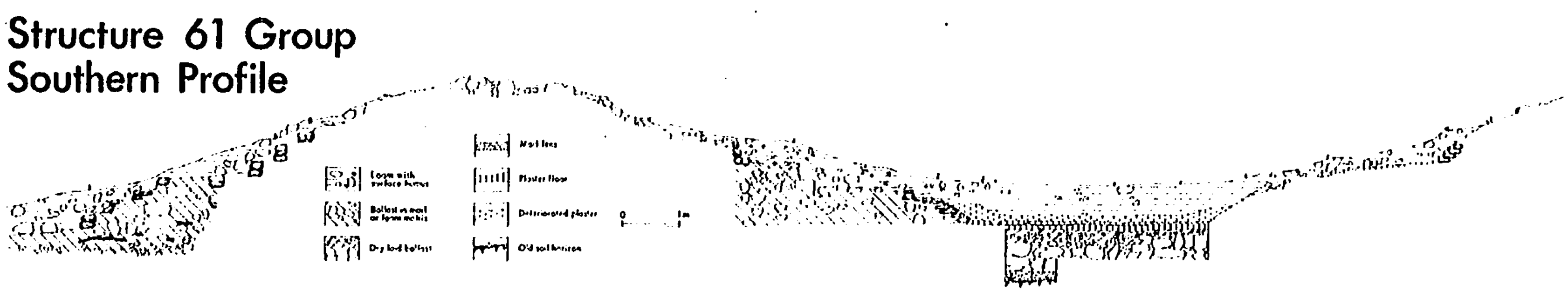

Fig. 73. Profile from the Structure 61 Group

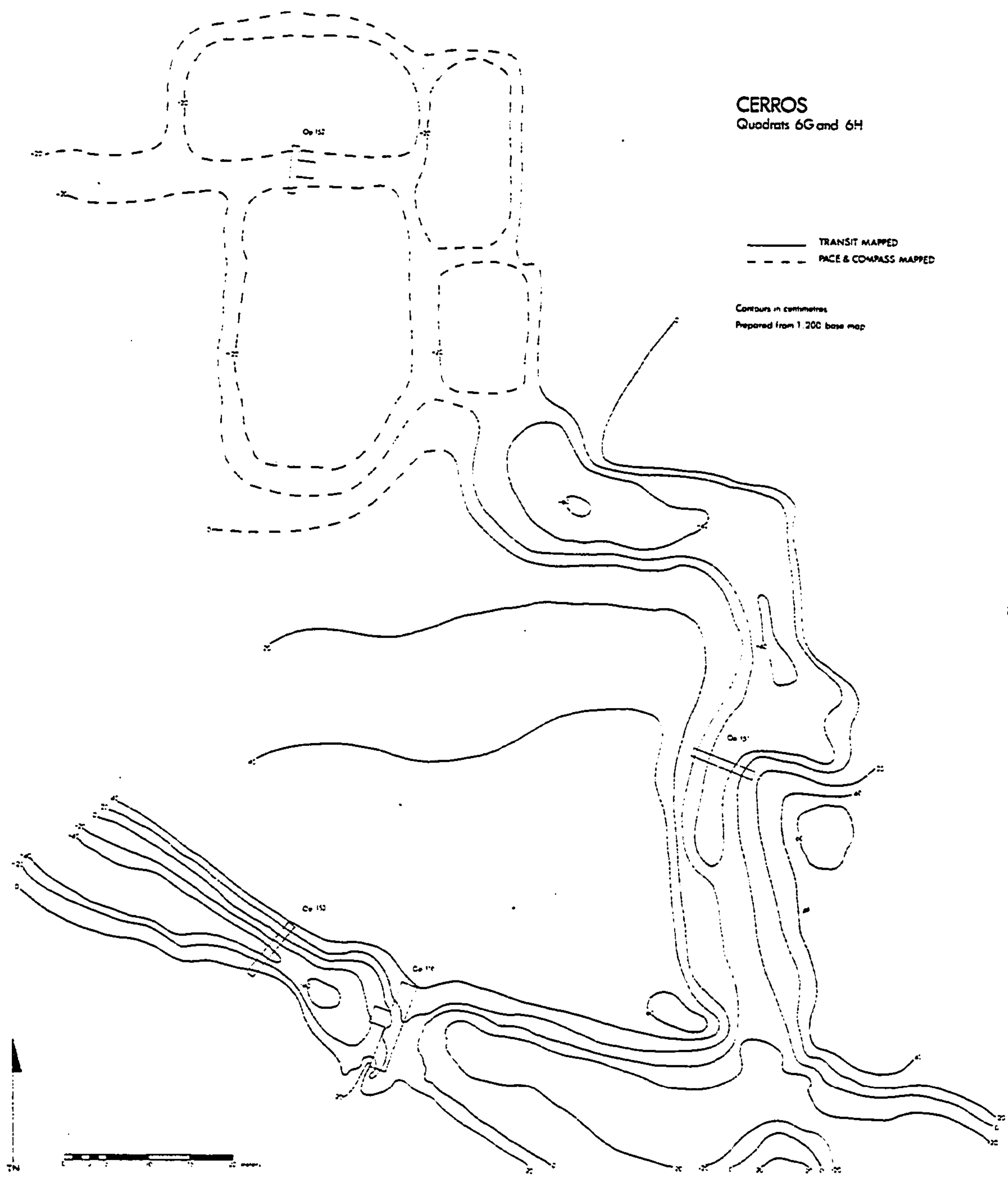

Fig. 74. Contour Map of Canal System

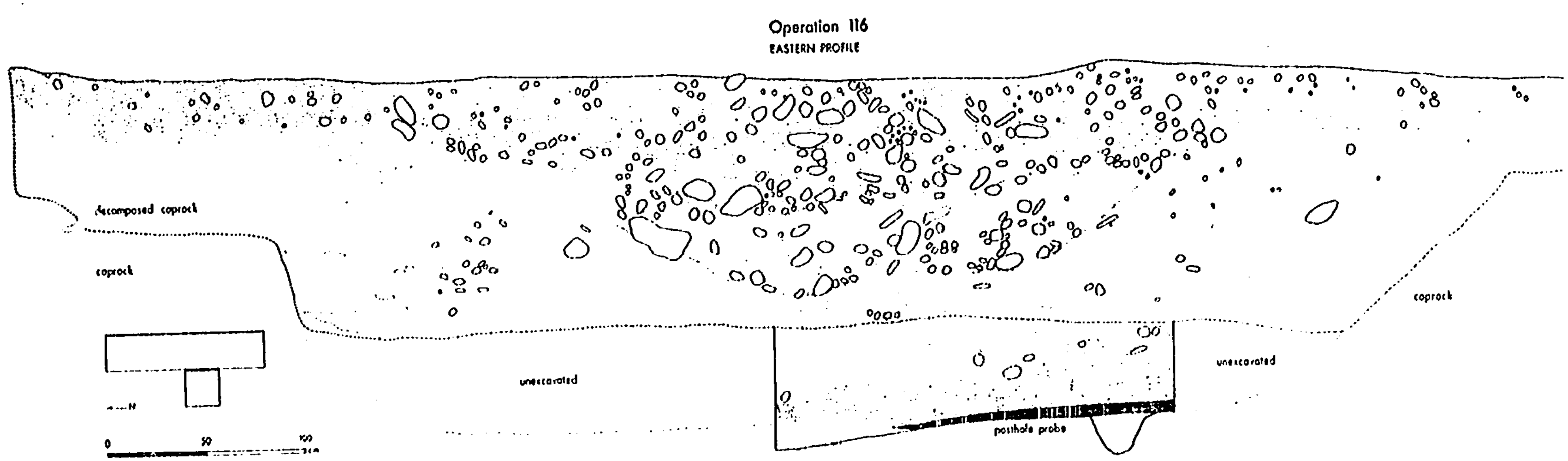

Fig. 75. Profile from the Main Canal and Causeway Exposure (Operation 116)

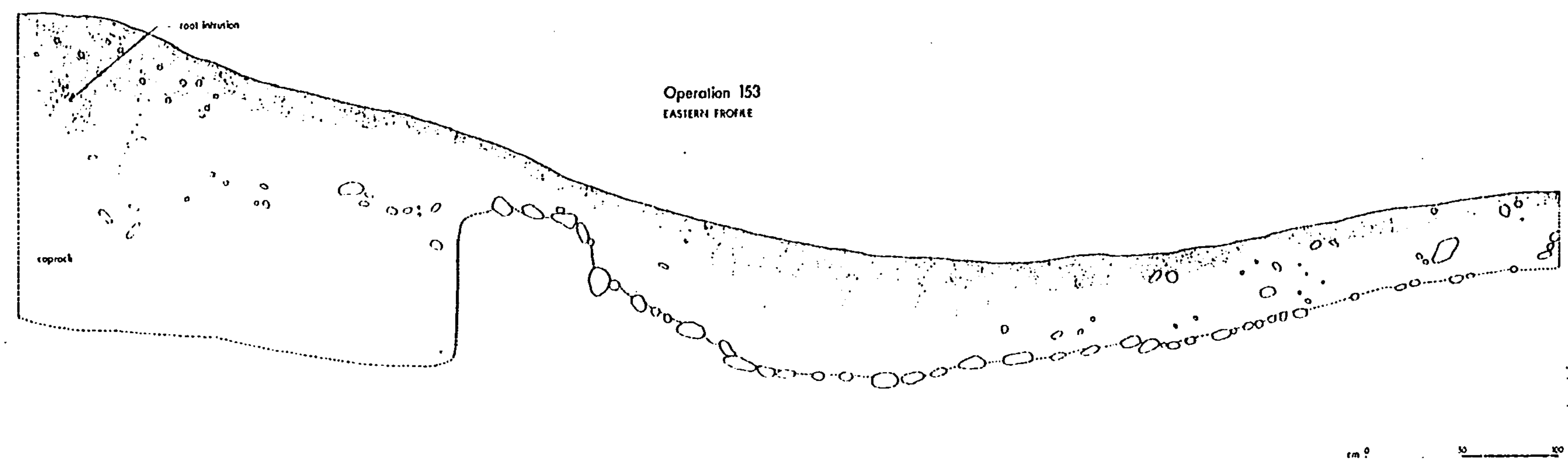

Fig. 76. Profile from the Main Canal (Operation 153)

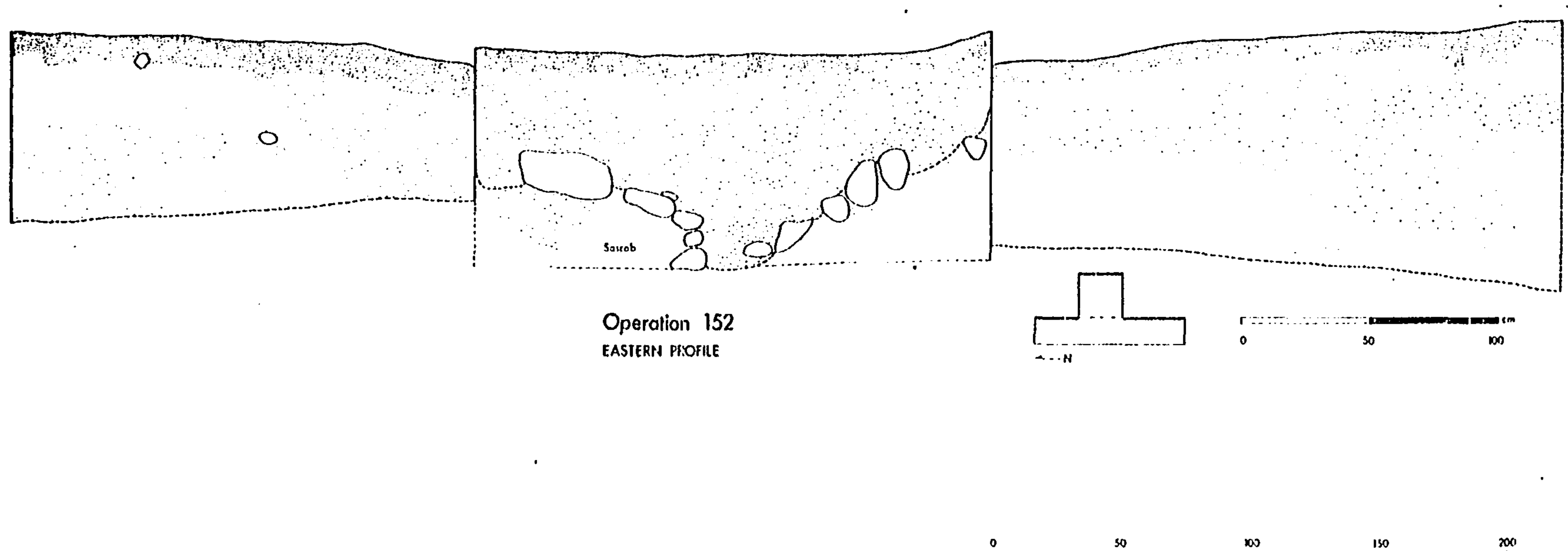

Fig. 77. Profile from the Minor Feeder Canal (Operation 152)

APPENDIX F

CHRONOLOGICAL CHART

1500		
1400	LOBIL	
1300	(Late Postclassic)	
1200	NEW TOWN	
1000	(Early Postclassic)	
900		
800	TEPEU	
700	(Late Classic)	
600		
500		
400	TZAKOL	
300	(Early Classic)	
200		
	----FLORAL PARK (Proto-Classic)	
100		
A.D.		
	CHICANEL	Tulix
B.C.	(Late Preclassic)	
100		Co'h
200		
300		Ixtabai
400		
500	MAMOM	
600	(Middle Preclassic)	
700		

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